

Effect of Harvest Dates on Seed Coat Color of Pinto Beans

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Introduction

Dry beans need to have a typical color of a particular market class to be free of off-type seeds and seed discoloration. Seedcoat color is an important trait in Pinto Beans. Consumers prefer pinto cultivars with bright and shiny mottle colored seedcoat and bright yellow hilum. (Muharrem et al., 2001). Several factors may cause seedcoat discoloration, including light, temperature, moisture, storage, diseases, as well as the genotype of the cultivar. Pinto seed coat color darkens while the beans are in storage. The color becomes darker with increasing lengths of storage (Huges and Sadsted, 1975). Light exposure and temperature may also interact with moisture and genotypes to cause seedcoat discoloration (Muharrem et al., 2001). Park and Maga (1999) reported that color stability of pinto beans was influenced by moisture content, physico-chemical seed characteristics and genotype.

Material and Methods

Twenty pinto bean cultivars (Apache, Aztec, Bill-Z, Burke, Buster, Chase, Elizabeth, Fargo, Focus, GTS-900, Kodiak, Maverick, Montrose, Othello, Rally, Remington, Topaz, UI-114, UI-320, and Winchester) were planted at Prosper and Fargo, North Dakota in 2003 and 2004 growing seasons. The study was harvested at four different dates with an interval of 15 days between consecutive harvest dates. The Fargo location in 2004 was lost due to excessive precipitation. The experimental design was RCBD with three reps in a split-plot arrangement. Cultivars constituted the main plot, while the harvest dates constituted the subplots. Seed color was evaluated for each sample using a Agtron Color Quality Meter (calibration: black = 0, white = 90).

Results and Discussion

Results from 2003 and 2004 growing seasons at Fargo and Prosper, ND show significant differences among harvest dates and cultivars. The interaction cultivar x harvest date was only significant in 2003 at both locations. In General beans harvested on the first and on the last harvest dates had the lightest and darkest color across all cultivars, respectively. Seed coat color was darker in 2004 than 2003, probably due to cold temperatures and excessive rainfall during the growing season. On average color score reduced 8 points between the first and the last harvest date in both seasons.

Results obtained in 2004 were not consistent with the data obtained in 2003, with the exception of Montrose, which is one of the cultivars with the lightest color in both growing seasons. Color score means for the 1st and 4th harvest dates are presented in Table 1. >Winchester=, which was one of the best from 2003 data, resulted to be one of the darkest cultivars in 2004 growing season. >Kodiak= which scored as the darkest seed coat color in 2003, is among the middle range in seed coat color in 2004 results.

Conclusions

Harvest date had a significant effect on seed coat color of pinto beans. Cultivars respond differently to the environment, so genetic factors could be involved. Pinto beans should be harvested as soon as possible, since the longer the pinto beans are exposed to the environment the darker the color of the seed coat.

Table 1. Color score means from the first and the fourth harvest dates, at Fargo and Prosper, North Dakota, during 2003 and 2004 growing seasons.

Cultivar (cul)	Harvest Dates (hd)						
	Fargo 2003		Prosper 2003		Prosper 2004		
	1 st	4 th	1 st	4 th	1 st	4 th	
	scu ¹						
APACHE	41.6	34.1	39.0	33.8	36.4	29.4	
AZTEC	45.0	30.3	37.9	29.5	35.4	30.0	
BILL-Z	45.9	37.2	41.5	34.2	37.3	31.5	
BURKE	48.6	34.4	39.0	31.5	35.2	28.9	
BUSTER	48.4	34.3	40.0	28.6	39.6	33.0	
CHASE	44.5	36.2	39.7	33.1	37.3	31.1	
ELIZABETH	42.3	32.8	39.2	33.3	34.2	30.6	
FARGO	44.2	36.7	41.2	35.9	39.4	32.5	
FOCUS	44.5	33.8	40.8	30.1	36.6	30.9	
GTS-900	40.2	29.7	38.3	29.3	35.6	29.3	
KODIAK	53.6	29.7	40.1	28.7	39.7	30.0	
MAVERICK	46.9	36.2	41.2	35.6	39.4	32.3	
MONTROSE	44.6	38.6	40.0	35.8	40.3	33.1	
OTHELLO	49.2	36.3	39.5	33.6	36.3	29.8	
RALLY	43.1	31.5	36.4	28.3	36.6	30.2	
REMINGTON	52.3	35.6	42.2	33.8	38.3	32.4	
TOPAZ	45.3	33.9	39.9	30.8	37.6	31.5	
UI-114	43.4	36.9	38.8	34.9	37.7	29.3	
UI-320	40.9	31.7	37.5	31.1	31.8	28.4	
WINCHESTER	42.0	33.1	38.1	32.3	32.8	27.7	
cul x hd LSD _{0.05} (p-value)		2.2 (0.0001)		2.5 (0.0001)		NS (0.459)	

¹ standard color units; the higher the number, the lighter the color.

References

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