

**NEW from
MSU**

Santa Fe

A NEW PINTO BEAN
for Michigan



- Upright pinto bean variety with resistance to lodging.
- Erect, short-vine growth habit suitable for direct harvest.
- Matures in 91 days, three days earlier than Stampede and La Paz.
- Uniform maturity and excellent dry-down.
- Performs well under moderate white mold pressure.
- Resistant to strains of anthracnose, rust and mosaic virus.
- Large seed size with good canning quality and seed integrity after cooking.

Santa Fe is a new large-seeded pinto bean variety from Michigan State University. Santa Fe is a competitive-yielding, midseason-maturing variety with an upright, short-vine growth habit that exhibits white mold avoidance. Santa Fe is resistant to strains of bean rust, anthracnose and bean common mosaic virus present in Michigan. Santa Fe most closely resembles pinto bean varieties La Paz and Stampede in plant appearance but is earlier maturing with excellent dry-down at maturity.

Origin and Breeding History

Santa Fe, tested as breeding line P04205, was developed as an upright, short-vine, midseason-maturity pinto bean variety with disease resistance and good canning quality. Santa Fe was developed from the cross of two MSU breeding lines, P99119 and G99750. P99119 is an upright pinto with avoidance to white mold that was derived

from a cross of P94211 and Matterhorn great northern (GN). Breeding line G99750 (BDM-RMR-11/Matterhorn) is an upright GN line with avoidance to white mold. The purpose of the cross was to combine sources of avoidance to white mold and incorporate yield potential and desirable agronomic characteristics of Matterhorn GN into the pinto seed type. The cross made in 2000 was advanced to the F₇ generation and entered into yield trials in 2004 under the code number P04205.

Agronomic and Disease Information

Santa Fe exhibits the upright, short-vine growth habit combined with good resistance to lodging. Santa Fe is similar in appearance to Matterhorn and is more erect than either Buster or Othello. The differences in erectness are reflected in the higher lodging scores for both Buster (3.1) and Othello (3.5) than Santa Fe (2.0) and La Paz (2.0). Plants of Santa Fe average 19

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inches in height — taller than Buster and Othello but slightly shorter than La Paz and Stampede. Santa Fe is a midseason bean, maturing 91 days after planting, two days later than Buster, seven days later than Othello, one day earlier than Stampede and two days earlier than La Paz. The range in maturity is from 88 to 92 days, depending on season and location. Santa Fe has demonstrated uniform maturity and dry-down similar to Matterhorn but has a higher agronomic acceptance rating because of its upright habit, resistance to lodging and favorable higher pod placement in the plant canopy. The differences in plant structure and maturity between Santa Fe and other pintos are reflected in the higher selection index for Santa Fe. The new varieties La

Paz and Stampede exhibit many of the same desirable upright traits, but their later maturity is reflected in a lower selection index (Table 1).

Santa Fe was tested for five years (2004-08) over 33 locations in cooperation with colleagues in Michigan, North Dakota, Colorado, Nebraska, Idaho, Washington and Ontario. The combined yield data comparisons with other pinto bean varieties for 2008 are shown in Table 2. Over all 33 locations, Santa Fe yielded 24.4 hundredweight (cwt)/acre. Yield ranged from a high of 42.9 cwt/acre in Montcalm County to a low of 14.1 cwt/acre under moisture stress in Presque Isle County in 2006. With the narrow row width (20 inches) and direct harvest, Santa Fe yielded 35.1 cwt/acre in 2008 and appears well-

sued to this increasingly popular management system. La Paz pinto was the only cultivar with higher yield (107 percent), but it was compared at a limited number of locations (seven) because La Paz is new and was not available for prior testing. In 2008, no significant differences in yield were observed between Santa Fe and seven other pinto bean varieties grown at nine locations in North America. Mean yields for varieties ranged from 27 to 29.4 cwt/acre, and Santa Fe yielded 28.1 cwt/acre. Data illustrate the similarity in yield among contemporary pinto varieties, so growers should choose a pinto variety on criteria other than yield. Growers should follow current recommended practices for fertility and weed control in growing Santa Fe beans.

Table 1. Comparison of agronomic, disease and canning characteristics of Santa Fe with other pinto bean varieties over 2 to 4 years of testing in Michigan.

VARIETIES	SANTA FE	BUSTER	OTHELLO	LA PAZ	STAMPEDE
AGRONOMIC TRAITS					
DAYS TO FLOWER	44	42	39	48	46
DAYS TO MATURE	91	89	84	93	92
HEIGHT (inches)	19	18	17	21	20
LODGING SCORE	2.0	3.1	3.5	2.0	1.5
SELECTION INDEX	5.3	3.1	2.6	4.0	4.8
100 SEED WEIGHT (grams)	40.4	36.8	36.0	37.0	38.7
YIELD (percent)	100	101	95	107	100
DISEASE RESISTANCE TRAITS					
BCMV	R	R	R	R	R
ANTHRACNOSE RACE 7	R	S	S	S	S
ANTHRACNOSE RACE 73	S	S	S	S	S
RUST RACE 53	HR	S	S	HR	HR
COMMON BACTERIAL BLIGHT (CBB)	S	S	S	S	S
WHITE MOLD (percent)	57	—	—	—	—
CANNING QUALITY TRAITS					
COLOR L-SCALE	35	38	40	—	—
WASHED DRAINED RATIO	1.2	1.1	1.2	—	—
HYDRATION RATIO	2.0	2.0	2.0	—	—
TEXTURE (kg/100 g)	73	106	79	—	—
VISUAL RATING (3 yr)	3.0	2.4	4.5	4.0	2.6
LA PAZ, STAMPEDE – 2-YEAR DATA; LODGING: 1 = ERECT, 5 = PROSTRATE. SELECTION INDEX: 1 = WORST, 5 = AVERAGE, 9 = EXCELLENT. DISEASES: BCMV = BEAN COMMON MOSAIC VIRUS, R = RESISTANT, S = SUSCEPTIBLE; RUST, HR=HIGHLY RESISTANT. CANNING – OVERNIGHT SOAK; VISUAL RATING: 1 = VERY UNDESIRABLE, 4 = NEITHER DESIRABLE NOR UNDESIRABLE, 7 = VERY DESIRABLE.					

Table 2. Yield of eight pinto bean varieties evaluated across nine locations in North America in 2008.

Variety	Locations	Mich.	Mo.	N.D.	Neb.	N.Y.	Ont.	Wash.	Wyo.	Calif.	Mean
	Source	cwt/acre									
Kimberly	UI	23.5	33.4	23.5	33.9	15.8	14.3	47.0	36.1	36.7	29.4
Quincy	WSU	14.5	34.0	21.9	28.2	19.9	18.2	49.7	44.4	31.6	29.1
Lariat	NDSU	21.4	36.4	25.4	22.1	14.1	24.7	46.5	29.3	38.9	28.8
Stampede	NDSU	22.1	25.9	25.3	28.3	17.7	16.2	46.1	37.3	34.5	28.1
Santa Fe	MSU	16.6	32.2	25.1	27.4	27.5	20.2	39.1	34.8	29.7	28.1
Croissant	CSU	17.5	32.5	18.4	27.0	20.8	22.1	45.3	33.0	32.7	27.7
Shoshone	UI	14.8	27.2	25.8	26.3	22.7	19.2	38.6	33.5	35.7	27.1
Othello	WSU	13.5	35.6	20.4	24.2	20.9	16.0	41.7	37.0	33.7	27.0
Location Mean		18.0	32.2	23.2	27.2	19.9	18.9	44.2	35.7	34.2	28.2

UI = University of Idaho; WSU = Washington State University; NDSU = North Dakota State University; MSU = Michigan State University; CSU = Colorado State University.

Santa Fe possesses the single dominant *I* gene, which conditions resistance to seed-borne bean common mosaic virus (BCMV). Santa Fe is highly resistant to rust conditioned by the *Ur-3* gene and was rated resistant in field trials conducted at Beltsville, Md., in 2008. Santa Fe exhibits avoidance to white mold when compared with a traditional prostrate variety such as Beryl. Over four years of testing under white mold pressure, Santa Fe yielded 32.3 cwt/acre compared with 17.8 cwt/acre for the susceptible GN variety Beryl, despite white mold infection levels in excess of 40 percent every year. Santa Fe yielded 42.9 cwt/acre under white mold pressure in Montcalm in 2008. Othello yielded 32.8 cwt/acre there that year. Santa Fe is resistant to anthracnose race 7 but susceptible to race 73. Santa Fe is susceptible to common bacterial blight, exhibiting a similar level of susceptibility as other commercial pinto bean varieties.

Quality Characteristics

Santa Fe has a large pinto bean seed averaging 40 grams per 100 seeds with a range from 38 to 48 g per 100 seeds. The seed is larger than those of other commercial pinto varieties: Buster (37 g), Othello (36 g), La Paz (37 g) and Stampede (39 g). In canning trials, Santa Fe has been subjectively rated by a team of panelists as being average in cooking quality. Santa Fe rated 3 on a scale of 1 to 7, where 7 is best and 4 is midscale (neither acceptable nor unacceptable). Data on cooked color suggest that seed is slightly darker than that of Buster or Othello. In hydration and drained weight ratios, Santa Fe exhibited no differences with other commercial pinto bean varieties. In MSU canning trials, hydration ratios (2) are high, and drained weight ratios (1.2) are low — pinto beans are blanched overnight to remove the mottled color pattern before canning. Santa Fe is similar to

Othello in texture; Buster is firmer. The texture of 73 kilos per 100 g is well within the acceptable range of 50 to 80 kg per 100 g for processed pinto beans. Santa Fe has an acceptable visual score compared to other commercial pinto varieties. Within the commercial pinto bean class, Othello demonstrated the best overall canning quality, and Buster consistently exhibits inferior canning quality.

Release and Research Fee

Santa Fe was released by Michigan State University with the option that Santa Fe be sold for seed by variety name only as a class of certified seed under the three-class system used in Michigan (breeder, foundation, certified). A royalty will be assessed on each hundredweight unit of foundation seed sold. The variety is licensed to the Michigan Crop Improvement Association, which will collect the royalty. Plant variety protection is pending.

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