RELEASE OF ‘SANTA FE’ PINTO BEAN

James D. Kelly¹, Greg V. Varner² and Brian Long¹

¹Crop and Soil Sciences, Michigan State University, East Lansing, MI 48824;
and ²Production Research Advisory Board, Saginaw, MI

The Michigan Agricultural Experiment Station announces the release of ‘Santa Fe’ pinto bean (*Phaseolus vulgaris* L.) variety. Santa Fe was developed at Michigan State University and tested in Production Research Advisory Board Statewide Trials and Michigan State University Dry Bean Variety Testing Program as P04205 [http://www.css.msu.edu/VarietyTrials/DryBean_HomePage.html](http://www.css.msu.edu/VarietyTrials/DryBean_HomePage.html).

P04205 pinto bean breeding line was developed from the cross: P99119/G99750. MSU breeding line P99119 is an upright pinto with avoidance to white mold. It was derived from cross of P94211 and Matterhorn great northern. MSU 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. P04205 was developed using pedigree selection and one generation of mass selection in winter nursery trial and was entered into yield trials as a F₄:₆ breeding line in 2004.

**Yield Performance:**

P04205 has been tested for four years (2004-07) over 15 locations by MSU in cooperation with colleagues in Michigan, North Dakota, Colorado, Nebraska (MRPN), Idaho and Washington. Over all 15 locations, P04205 yielded 22.6 cwt/acre. Yield ranged from a high of over 34 cwt/acre in Montcalm County to a low of 14 cwt/acre under stress in Presque Isle County in 2006. Under the narrow row (20") width testing combined with direct harvest used at the B&B Farm, P04205 yielded 23 cwt/acre in 2007 and appears well suited to this increasingly popular management system. No significant differences in yield were observed between P04205 and other pinto cultivars. Buster and Othello were slightly lower yielding but this may be a reflection of 2007 data as plots were direct harvested. The new La Paz pinto was higher yielding but was only compared at two locations in 2007. No significant differences were detected in yield in comparisons with Matterhorn.

**Agronomic Features:**

P04205 exhibits the type-II upright short vine growth habit combined with resistance to lodging. P04205 exhibits an overall upright appearance similar to Matterhorn and is more erect than either Buster or Othello pintos. Othello have a type III prostrate vine habit and Buster has an intermediate type IIb plant structure. The differences in erectness are reflected in the higher lodging scores for both Buster (3.1) and Othello (3.3) when compared to P04205, Matterhorn and La Paz (2.0). Plants of P04205 average 49 cm in height and are taller than Buster and Othello but slightly shorter than La Paz. P04205 is a mid-season bean maturing 90 days after planting, 2d later than Buster, 5 d later than Othello and 6 d earlier than La Paz. The range in maturity is from 88-92 days depending on season and location. P04205 has demonstrated the same uniform maturity and dry-down as Matterhorn but has a higher agronomic acceptance rating due to its upright habit, resistance to lodging and excellent pod load and favorable high pod placement in the plant canopy. The differences in plant structure and erectness between P04205 and other pintos are reflected in the higher visual scores for P04205.
The new La Paz variety exhibits many of the same desirable architectural traits but it is significantly later in maturity.

**Disease Resistance:**

P04205 possesses the single dominant hypersensitive \( I \) gene which conditions resistance to seed-borne Bean Common Mosaic Virus ( BCMV ) but is sensitive to the temperature-insensitive-necrosis-inducing strains of BCMNV like NL 3 and NL 8. P04205 is highly resistant to rust conditioned by the \( U r-3 \) gene and is essentially immune to the indigenous rust [incited by *Uromyces appendiculatus* (Pers.:Pers.) Unger] races prevalent in Michigan. P04205 exhibits avoidance to white mold [caused by *Sclerotinia sclerotiorum* (Lib.) de Bary] when compared to traditional prostrate pinto varieties. Over three years of testing under white mold pressure, P04205 yielded 28.8 cwt/a compared with yield of 14.3 cwt/a for the susceptible variety Beryl. In fact the highest yields for P04205 have been recorded under white mold pressure at the Montcalm test site. P04205 is susceptible to race 73 anthracnose caused by *Colletotrichum lindemuthianum* (Sacc. et Magn) Lams.-Scrib. P04205 has a similar level of susceptibility to common bacterial blight [CBB caused by *Xanthomonas axonopodis* pv. *phaseoli* (Smith) Dye] as other commercial pinto bean varieties.

**Quality Characteristics:**

P04205 has a large pinto bean seed averaging 42 g/100 seeds and size ranges from 38-48 g/100 seeds. The seed is larger than other commercial pinto varieties: Buster (40g), Othello (37g), and La Paz (35g). In canning trials, P04205 has been subjectively rated by a team of panelists as being above average in cooking quality. P04205 rated 3.0 on a scale of 1 to 7 where 7 is best and 4 is mid scale (neither acceptable nor unacceptable). This evaluation is based upon whole bean integrity (no splitting or clumping); uniformity of size (uniform water uptake); color (no after darkening); clear brine (no starch extrusion into canning liquid). Data on cooked color, suggest that seed is slightly darker than Buster or Othello. The hydration and drained weight ratios exhibited no differences between P04205 and other commercial pinto bean varieties. Hydration ratios (2.0) were high while drained weight ratios (1.2) were low as the beans are blanched overnight to remove the color pattern. P04205 is similar to Othello in texture, whereas Buster is firmer in texture. Texture of 73 kg/100g is well within the acceptable range of 50 to 80 kg/100 g for processed pinto beans. P04205 has acceptable visual score compared to commercial pintos. Within the commercial pinto bean class, Othello demonstrated the best overall canning quality whereas Buster consistently exhibits inferior canning quality.

**Naming and Release Procedure:**

Pinto bean breeding line P04205 was released as the variety *Santa Fe*. The recommendation is that Santa Fe will be available under license from Michigan State University, with the option that Santa Fe be sold for seed by *name only* under the Foundation and Certified Seed classes. The variety will only be sold commercially as a class of Certified Seed under the three-class system used in Michigan. A royalty will be assessed on each hundredweight unit of Foundation Seed sold. Breeder Seed will be maintained by the Michigan Agricultural Experiment Station under license with the Michigan Crop Improvement Association. Plant Variety Protection (PVP) is anticipated and parties interested in licensing Santa Fe may contact MSU Technologies.