



MEMORANDUM

TO: Specialty Crop Variety Release Committee

FROM: Norm Weeden, pea breeder/geneticist

DATE: January 10, 2008

RE: Proposal for MSU public (open to discussion) cultivar release of MSUPBL27

The following motion and supporting documentation is presented for consideration at the 2008 Cultivar Release and Recommendation Meeting in Bozeman.

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Motion: That Montana State University pea breeding line 27 (MSUPBL27) high-amylose dry pea be approved for release in 2008.

Pedigree: Majoret/Bolero

Recommendation: Protected MSU Public Release.

Potential names: To be named prior to Foundation seed release.

Selection history: MSUPBL27 from the cross 'Majoret' x 'Bolero' made in spring, 2004. 'Bolero' produced seeds with a high amylose content and 'Majoret' was one of the better performing varieties in small trials planted at Conrad and Moccasin the previous summer. One F₁ plant was grown in the field in 2004. Approximately 70 F₂ plants were grown in the greenhouse at Bozeman in fall, 2004 and lines were selected that were semi-leafless and high in amylose content. F₃ families from the selected F₂ were grown in the greenhouse at Bozeman in spring 2005, and single plants displaying an erect growth habit, excellent vigor, good pod distribution and good yield were selected for field

testing. Of the approximately 50 F₄ families tested for yield and habit at the Hort Farm in Bozeman in the summer of 2005, five were selected on the basis of productivity and acceptable agronomic type and harvested as bulks. Seed of these bulks was increased in a winter grow out at Waddell, AZ and planted at the Hort Farm for yield trials in summer 2006. MSUPBL27 gave the highest yield of the lines tested, although its yield was not significantly different from two other lines (MSU89C and MSUPBL11) or the low amylose parent (Majoret). Although there was insufficient seed of MSUPBL27 to send to Moccasin in 2006, both MSU89C and MSUPBL11 were grown at Moccasin that summer, with MSU89C performing in the top category of the 11 high-amylose lines being tested. Seed from summer 2006 was saved for more extensive yield trials at Bozeman, Conrad, Moccasin and Sidney in summer 2007.

Purification/seed stocks: MSUPBL27 is derived from a single F₃ plant. The F₄, F₅ and F₆ have been uniform for high amylose, wrinkled seed, green cotyledon, white flower, semi-leafless, semi-dwarf and time to maturity. In the 2007 yield trials the line displayed visual uniformity with regard to height, flowering time, color and maturity.

Description: MSUPBL27 is the first high-amylose dry pea proposed for release in North America. It is semi-leafless, semi-dwarf, moderately yielding green dry pea with medium test weight and maturity. The line has good resistance to lodging and performs well under no-till conditions. It is susceptible to powdery mildew under greenhouse conditions but has been free of disease in the seven location/years it has been grown in the field. MSUPBL27 could provide growers with a crop in their rotation that commands a premium price because of its nutritional properties.

Characteristics/comparisons

Yield. The primary concern in the development of a high-amylose dry pea is whether a significant loss in yield will be associated with the incorporation of the high amylose character. All yield trials were done under dry land conditions. Yield trials at Bozeman, Sidney and the 2006 yield trials at Moccasin were planted in fields that had been cultivated. Yield trials at Conrad and the 2007 yield trials at Moccasin were no-till and planted in wheat and barley stubble, respectively.

The yield results from both 2006 and 2007 (Table 1) demonstrated that MSUPBL27 consistently yielded as well or better than Majoret, the low-amylose parent of the original cross. The other parent, Bolero, yielded slightly less, and it displayed a high susceptibility to lodging (see below). Delta, a high-yielding low-amylose variety, consistently yielded better than any of the high-amylose lines. In 2007 at Bozeman and Moccasin it also yielded better than nearly all of the low-amylose varieties. The yield values in Table 1 are not corrected for % moisture because such data were not available from most of the yield trials. However, the high-amylose pea generally has a moisture content about 1% lower (8-10% compared to 9-11%) than high-amylose varieties. Correcting for this difference in moisture content increases slightly the actual starch and protein yield in the high-amylose relative to the low-amylose lines.

Table 1. Yield comparisons of MSUPBL27 with low-amylose dry pea varieties

<u>Variety/selection</u> ¹	<u>Location (year)</u>	<u>Yield (lbs/acre) +/- SD</u>
Majoret (LA)	Bozeman (06)	1204 +/- 256
MSU89C (HA)	Bozeman (06)	1146 +/- 176
MSUPBL27 (HA)	Bozeman (06)	1268 +/- 86
MSUPBL11 (HA)	Bozeman (06)	1165 +/- 74
MSUPBL41 (HA)	Bozeman (06)	935 +/- 110
Bolero (Proc)	Moccasin (06)	1051 +/- 20
MSU89C (HA)	Moccasin (06)	1154 +/- 288
MSUPBL11 (HA)	Moccasin (06)	916 +/- 51
MSUPBL41 (HA)	Moccasin (06)	869 +/- 59
Delta (LA)	Bozeman (07)	1350 +/- 92
Majoret (LA)	Bozeman (07)	1033 +/- 227
MSU89C (HA)	Bozeman (07)	1063 +/- 19
MSUPBL27 (HA)	Bozeman (07)	1061 +/- 48
Durango (Proc)	Bozeman (07)	570 +/- 112
Delta (LA)	Moccasin (07)	1627
Salute (LA)	Moccasin (07)	1608
Majoret (LA)	Moccasin (07)	1290
Stirling (LA)	Moccasin (07)	1360
MSU89C (HA)	Moccasin (07)	1193
MSUPBL27 (HA)	Moccasin (07)	1256
MSUPBL41 (HA)	Moccasin (07)	1122
Delta (LA)	Sidney (07)	2230 +/- 409
Majoret (LA)	Sidney (07)	1697 +/- 543
Durango (Proc)	Sidney (07)	1188 +/- 381
MSU89C (HA)	Sidney (07)	1755 +/- 382
MSUPBL27 (HA)	Sidney (07)	1450 +/- 167
MSU89C (HA)	Conrad (07)	585 +/- 60
MSUPBL27 (HA)	Conrad (07)	823 +/- 216
Durango (Proc)	Conrad (07)	801 +/- 117
Cruiser (LA)	Conrad (07)	901 +/- 78

¹ LA = low-amylose dry pea, HA = high-amylose dry pea, Proc = processing pea

Lodging tolerance. In addition to high amylose, an ability to maintain an erect growth habit is essential for any pea release in Montana. The high-amylose parent (Bolero) was highly susceptible to lodging, whereas Majoret is relatively tolerant. MSUPBL27 was determined to be relatively tolerant (4) on a 0-5 scale, where 0 indicates susceptibility to lodging and 5 indicates resistance (Table 2).

Seed weight. Hundred seed weight (cwt) for MSUPBL27 is moderate (19.3 g) and is significantly less than Majoret (21.0 g) or Delta (21.5 g) but greater than several other lines tested such as MSU89C (18.7 g) or Durango (16.1 g). All values are from seed grown at Bozeman in 2007.

Table 2. Lodging scores for Majoret, MSUPBL27, MSU89C, Bolero and Delta

<u>Location (Year)</u>	<u>Line examined</u>				
	<u>Majoret</u>	<u>MSUPBL27</u>	<u>MSU89C</u>	<u>Bolero</u>	<u>Delta</u>
Bozeman (05)	5	5	5	2	5
Bozeman (06)	4	4	4	2	--
Bozeman (07)	4	4	4	1	5
Moccasin (06)	--	4	4	1	5
Moccasin (07)	5	5	5	--	--
Conrad (07)	--	4	4	2 ¹	5 ¹

¹At Conrad (07) Durango was substituted for Bolero and Cruiser for Delta.

Test weight. Test weight for MSUPBL27 grown at Moccasin is less (59.9 lb/bu) than the low-amylose parent (Majoret) (64.4 lb/bu). Indeed, all high-amylose lines tested at Moccasin had lower test weight values than the low-amylose lines (average for high-amylose lines = 60.1 lbs/bu; average for low-amylose lines = 64.1 lbs/bu). The ranges for the two types of peas did not overlap, and one factor contributing to this difference appears to be the better packing of the round seeded peas compared to the wrinkled seeded peas.

Plant height. MSUPBL27 is similar in height to Majoret, averaging 21 inches. At Bozeman, Delta was significantly taller than MSUPBL27, whereas at Moccasin it was slightly shorter. All lines at Conrad were much shorter than at Bozeman or Moccasin in 2007, probably due to the much drier conditions at the former locality in this year.

Disease reaction. When MSUPBL27 has been grown in the field plants were free of foliar disease and did not exhibit signs of wilt in soil know to be infested with *Fusarium oxysporum* f. sp. *pisi* race 1. In the greenhouse the line is susceptible to powdery mildew (*Erysiphe polygoni* DC).

Summary. MSUPBL27 is a high-amylose dry pea that performs similarly to Majoret, a low-amylose dry pea that has been a reasonably successful variety in the Northern Plains and the Palouse. It is the only high-amylose dry pea that has been developed for this region and offers the grower an opportunity to exploit both the health food market (with an ultra low glycemic index starch) and the cattle feed market (with a product that would help control bloat). Although several pea varieties available to Montana growers are better yielding than MSUPBL27, with market targeting MSUPBL27 should command a much higher price and thus a higher return to the grower. Because high-amylose lines derived from the Majoret x Bolero combination have been obtained that matched or exceed the yield of the low-amylose parent, it is probable that the yield of high-amylose lines can be increased through crosses with Delta, Salute, or Cruiser. Such work is currently in progress.