



MEMORANDUM

TO: Specialty Crop Variety Release Committee

FROM: Norm Weeden, pea breeder/geneticist

DATE: February 8, 2015

RE: Proposal for release of pea line MSUPBL37A

The following motion and supporting documentation is presented for consideration at the 2015 Cultivar Release and Recommendation Meeting in Bozeman.

Norman F. Weeden, Professor
Department of Plant Sciences & Plant Pathology
Montana State University
Bozeman, MT 59715-3140
nweeden@montana.edu
PHONE 406-994-7622, FAX 406-994-7600

Motion: That Montana State University pea breeding line 37A (MSUPBL37A) high-amylose yellow dry pea be approved for release in 2015.

Pedigree: Delta x BL29 (line derived from Majoret x Bolero)

Recommendation: Licensed Release.

Potential names: Greengold

Selection history: MSUPBL37A was derived from a complex cross with 'Amigo' as one parent and a line derived from a cross between 'Delta' and BL29. The latter was a line derived from a cross between 'Majoret' and 'Bolero'. MSUPBL37A was selected as a single F4 plant in the summer of 2010. The line was selected for its vigorous growth, erect, semi-leafless habit, high amylose, yellow cotyledon, and high yield. The line has been grown at Bozeman each summer since 2010 and has appear uniform (no off types requiring removal) during these grow outs.

Purification/seed stocks: MSUPBL37A is derived from a single F₄ plant. The F₅, F₆, F₇ and F₈ have been uniform for high amylose, wrinkled seed, yellow cotyledon, white flower, semi-leafless, semi-dwarf, and time to maturity. In the 2012, 2013, and 2014 yield trials the line displayed visual uniformity with regard to height, flowering time, color and maturity. In 2013 approximately 100,000 seeds were planted from seed produced in the 2012 yield trial in Bozeman, and the harvest of this field represents the breeder seed for this line. The testa color of MSUPBL37A is inconsistent, ranging from nearly clear to greenish even on seeds harvested from the same plant. We have analyzed the inheritance of this trait by examining seed produced from plants grown from clear-testa seeds and from plants grown from green-testa seeds. In both cases (and, indeed from basically any plant from this line we examined) we obtained both clear-testa and green-testa seeds. As we have been unable to select true breeding clear-testa lines we have concluded that the presence of some chlorophyll in the dry testa is an innate characteristic of the genotype.

Description: MSUPBL37A is the second high-amylose yellow dry pea proposed for release for the Northern Great Plains. It is similar to MSUPBLB10-10 in that it is semi-leafless, semi-dwarf, good yielding dry pea with medium test weight and maturity. The line has excellent resistance to lodging and bears most of its pods in the top third of the plant, facilitating mechanical harvesting. Like MSUPBLB10-10, it is susceptible to powdery mildew, but this disease has not been a problem in the field at Moccasin or at the Hort Farm. MSUPBL37A is slightly taller (2-3 cm) than MSUPBLB10-10 and has better stem strength. It flowers and matures several days later than MSUPBLB10-10. The light yellow cotyledon produces whitish flour that does not darken after processing into noodles. The presence of seeds with a greenish testa probably will require the removal of the testa before milling to avoid discoloration of the flour; however, removal of the testa is standard procedure when dry peas are used as for flour. MSUPBL37A would provide growers with a crop in their rotation that commands a premium price because of its nutraceutical properties.

Characteristics/comparisons

Yield. MSUPBL37A yields slightly less (about 5% less) than Delta, the most closely related low amylose variety. However, it yields approximately 5% higher than MSUPBLB10-10, the previous high amylose yellow dry pea released (Table 1) and considerably more than Amigo, a high amylose green dry pea released several years ago.

Amylose content. MSUPBL37A has a higher amylose content than its predecessor MSUPBLB10-10 (Table 2). The first six lines listed in Table 2 are typical low amylose lines. Ashton is fresh market green pea with high-amylose. As the primary intent of the breeding program is to develop dry peas with higher amylose content, this gain represents an important advance, particularly in combination with the modest gain in yield shown by MSUPBL37A.

Table 1. Yield comparisons of MSUPBL37A with selected dry pea varieties

<u>Variety</u>	<u>Location</u>	<u>Yield (lbs/acre)</u>
Delta	Hort Farm (11)	3324 (2 reps)
Mozart	Hort Farm (11)	3212 (2 reps)
MSUPBLB10-10	Hort Farm (11)	3000 (2 reps)
MSUPBL37A	Hort Farm (11)	3262 (2 reps)
Delta	Hort Farm (12)	2815 (3 reps)
Mozart	Hort Farm (12)	2790 (3 reps)
MSUPBLB10-10	Hort Farm (12)	3051 (3 reps)
MSUPBL37A	Hort Farm (12)	3161 (2 reps)
Delta	Hort Farm (13)	1773 (3 reps)
Mozart	Hort Farm (13)	1856 (3 reps)
MSUPBLB10-10	Hort Farm (13)	1905 (3 reps)
MSUPBL37A	Hort Farm (13)	1533 (3 reps)
Delta	Post Farm (14)	1168 (3 reps)
Mozart	Post Farm (14)	1227 (3 reps)
MSUPBLB10-10	Post Farm (14)	1056 (3 reps)
MSUPBL37A	Post Farm (14)	1154 (3 reps)

Statewide yield trials

Delta	Moccasin (12)	1313
MSUPBLB10-10	Moccasin (12)	1179
MSUPBL37A	Moccasin (12)	1552
Delta	Havre (12)	2222
MSUPBLB10-10	Havre (12)	2130
MSUPBL37A	Havre (12)	2073
Delta	Richland (12)	3706
MSUPBLB10-10	Richland (12)	3100
MSUPBL37A	Richland (12)	3355
Delta	Moccasin (14)	2632
MSUPBLB10-10	Moccasin (14)	2094
MSUPBL37A	Moccasin (14)	2185
Delta	Richland (14)	936
MSUPBLB10-10	Richland (14)	799
MSUPBL37A	Richland (14)	836
Delta	Corvallis (14)	1751
MSUPBLB10-10	Corvallis (14)	1645
MSUPBL37A	Corvallis (14)	1669

Total average yield over the 10 location/years

Delta	Total	2164
MSUPBLB10-10	Total	1996
MSUPBL37A	Total	2078

Table 2. Amylose content of Selected Dry Pea Varieties

<u>Variety</u>	<u>Amylose content (%)</u>
Delta	18.9
Highlight	17.8
Aragon	19.3
Striker	17.8
Majoret	20.8
Durango	20.8
Ashton	23.9
MSUPBLB10-10	24.7
MSUPBL37A	26.5

Lodging tolerance. Lodging tolerance is an essential trait for mechanized harvest in Montana. Delta displayed the most erect habit of the varieties we have examined at the Hort Farm and is the source of the lodging tolerance in MSUPBL37A. No difference has been observed between the two lines for susceptibility to lodging.

Seed weight. Hundred seed weight (cwt) for MSUPBL37A is moderate (22.0 g), slightly less than Delta (23.6 g) or Mozart (22.9 g) but comparable to MSUPBLB10-10 (22.1 g).

Dry pea test weight. At about 59.5 lbs/bu the test weight for MSUPBL37A is consistently lower than all other yellow pea lines tested, including Delta, which had a test weight between 64 and 65 lbs/bu. MSUPBLB10-10 displays a test weight of 60.0 lbs/bu, and other high-amylose lines display a similar lower test weight. The lower test weight appears to be characteristic of the wrinkled pea type.

Plant height. At the Hort Farm MSUPBL37A is very similar to Delta in height, being among the tallest of the semi-dwarf lines planted over the last six years. At Moccasin and Richland Delta and MSUPBL37A were relatively short compared to the other yellow pea lines tested.

Disease reaction. At the Hort Farm and Moccasin MSUPBL37A has been free of foliar disease and did not exhibit signs of wilt in soil known to be infested with *Fusarium oxysporum* f. sp. *pisi* race 1. In regions of higher summer moisture the line is expected to be susceptible to powdery mildew (*Erysiphe polygoni* DC).

Summary. MSUPBL37A is a high-amylose yellow dry pea that performs well under a short, cool season such as is experienced in the Gallatin Valley. Its yield is comparable to that of most low-amylose dry peas grown in this region. It is slightly taller, slightly more resistant to lodging, and somewhat later maturing than our previous release, MSUPBLB10-10. Of greater significance is its higher amylose content, as the intended use of the variety is to be processed to flour suitable for the consumption of individuals suffering from Type 2 diabetes, and a higher amylose to amylopectin ratio is what is desired in this use.