SOYBEAN PERFORMANCE IN ONTARIO IN 2003

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Introduction

Soybean is a potentially valuable new crop for Oregon. Soybean could provide a high quality protein for animal nutrition and oil for human consumption, both of which are in short supply in the Pacific Northwest. In addition, edible or vegetable soybean production could provide a raw material for specialized food products. Soybean is valuable as a rotation crop because of the soil-improving qualities of its residues and its N_2-fixing capability. Because of the high-value irrigated crops typically grown in the Snake River valley, soybeans may be economically feasible only at high yields.

Soybean varieties developed for the midwestern and southern states are not necessarily well adapted to Oregon's lower night temperatures, lower relative humidity, and other climatic differences. Previous research at Ontario, Oregon has shown that, compared to the commercial cultivars bred for the Midwest, plants for eastern Oregon need to have high tolerance to seed shatter and lodging, reduced plant height, increased seed set, and higher harvest index (ratio of seed to the whole plant).

M. Seddigh and G.D. Jolliff at Oregon State University, Corvallis identified a soybean line that would fill pods when subjected to cool night temperatures. Those lines were crossed at Corvallis with productive lines to produce OR 6 and OR 8, among others. At this point, the development moved to Ontario, Oregon. The later two lines were crossed at our request for several years with early-maturing high-yielding semi-dwarf lines by R.L. Cooper to produce semi-dwarf lines with potential adaptation to the Pacific Northwest. Selection criteria at the Malheur Experiment Station included high yield, zero lodging, zero shatter, low plant height, and maturity in the available growing season. In 1992, 241 single plants were selected from five F5 lines that were originally bred and selected for adaptation to eastern Oregon. Seed from these selections was planted and evaluated in 1993. A total of 18 selections were found promising and selected for further testing in larger plots from 1994 through 1999. Of the 18 lines, 8 were selected for further testing. In 1999, selections from one of the lines were made by Peter Sexton at the Central Oregon Agricultural Research and Extension Center in Madras, Oregon. Sixteen of these Madras selections were chosen for further testing. In 2000 selections were made from six of the 1992 Ontario lines and from OR-6. This report summarizes work done in 2003 as part of the continuing breeding and selection program to adapt soybeans to eastern Oregon.

Methods

The trial was conducted on a Greenleaf silt loam previously planted to soybean. Fifty lbs of P, 100 lb of K, 2 lb of Cu, and 1 lb of B were broadcast in the fall of 2002. The field was then disked twice, moldboard plowed, groundhogged twice and bedded to 22-inch rows.

Five commercial cultivars, 5 older lines selected at the Malheur Experiment Station in 1992, 9 lines selected in 1999 at the Central Oregon Agricultural Research and Extension Center, and 24 lines selected in 2000 at the Malheur Experiment Station were planted in plots four rows by 25 ft. The plots were arranged in a randomized complete block design with four replicates. The seed was planted on May 23 at 200,000 seeds/acre in rows 22 inches apart. *Rhizobium japonicum* soil implant inoculant was applied in the seed furrow at planting. Emergence started on May 28. The field was furrow irrigated as necessary. The field was sprayed on July 16 with Warrior at 0.03 lb ai/acre and Lannate at 0.4 lb ai/acre for lygus bug and stinkbug control. The field was sprayed again on August 4 with Dimethoate at 0.4 lb ai/acre for stinkbug, lygus bug, and spider mite control.

Plant height and reproductive stage were measured weekly for each cultivar. Stand counts were made in 3 ft of the middle two rows in each plot. Prior to harvest, each plot was evaluated for lodging and seed shatter. Lodging was rated as the degree to which the plants were leaning over (0 = vertical, 10 = prostrate). The middle two rows in each four-row plot were harvested on October 8 using a Wintersteiger Nurserymaster small plot combine. Beans were cleaned, weighed, and oven dried to determine moisture content. Dry bean yields were corrected to 13 percent moisture. Variety lodging, plant population, yield, and seed count were compared by analysis of variance. Means separation was determined by the protected least significant difference test.

Results and Discussion

Yields ranged from 13.5 bu/acre for '203' to 61.6 bu/acre for 'M92-085' (Table 1). Several of the lines had seed counts sufficient for the manufacturing of tofu (< 2,270 seeds/lb). Several lines combined high yields, little lodging, and early maturity. Considerable yield advantages were obtained through continued selection.

Table 1. Performance of soybean cultivars ranked by yield in 2003, Malheur Experiment Station, Oregon State University, Ontario, OR. Cultivars M92-085 through M92-350 are from single plant selections made at the Malheur Experiment Station in 1992. Cultivars M1 through M16 are from single plant selections made from M92-330 by Peter Sexton at the Central Oregon Agricultural Research and Extension Center in Madras, OR in 1999.

Cultivar	Origin	Days to maturity	Days to harvest maturity	Lodging	Height	Seed count	Yield
		days from emergence		0-10	cm	seeds/lb	bu/acre
M92-085		100	107	3.3	90	2,021	61.6
M1		93	100	2.3	89	2,122	59.7
107	M92-085	93	100	2.5	90	2,073	59.5
Lambert		107	114	8.3	87	2,461	58.6
M2		100	107	3.3	87	2,065	57.9
104	M92-085	93	100	3.8	96	2,189	57.5
305	M92-220	107	114	1.8	93	2,421	57.4
M12		100	107	4	93	2,092	56.1
M16		93	100	2	93	2,123	55.6
M9		93	100	4	93	2,143	55.4
106	M92-085	100	107	2.3	91	2,004	55.4
M4		93	100	1.8	92	2,061	55.3
103	M92-085	100	107	2.5	88	1,937	55.3
Korada		107	114	3.8	88	2,333	55.2
303	M92-220	107	114	1.3	89	2,500	54.7
307	M92-220	100	107	1	84	2,509	54.5
601	M92-314	100	107	1.3	92	2,336	54.4
108	M92-085	100	107	2.5	90	2,048	54.3
313	M92-220	107	114	3.3	86	2,491	53.8
511	M92-237	100	107	1.3	83	2,388	53.8
M13		93	100	2.5	82	2,156	53.2
909	OR-6	93	100	6.8	80	2,300	53.2
312	M92-220	100	107	1	86	2,586	53.1
514	M92-237	93	100	0.3	88	2,166	52.5
M15		93	100	3.5	93	2,046	52.4
M3		93	100	2.3	90	2,089	52.1
311	M92-220	100	107	0.3	82	2,476	51.1
905	OR-6	93	100	6.8	80	2,428	50.3
M92-225		93	100	2.5	90	2,026	50.1
OR-6		93	100	7.8	74	2,282	49.6
M92-220		107	114	3.5	98	2,433	49.5
101	M92-085	100	107	2.5	89	1,975	49.5
608	M92-314	93	100	2	90	1,951	49.5
308	M92-220	107	114	1.3	86	2,491	49.4
Gnome 85		107	114	8.3	67	2,216	48.7
309	M92-220	107	114	1.5	93	2,480	48.4
Evans		107	114	9	74	2,164	41
Sibley		114	121	8.5	84	2,280	40.5
OR-8		107	114	8.5	82	2,272	39.4
211	M92-213	100	107	0	65	1,904	20.9
208	M92-213	107	114	0	53	1,822	14.3
202	M92-213	100	107	0	55	1,850	13.6
203	M92-213	100	107	0	65	1,892	13.5
LSD (0.05)				1.4		152	10.7