SOYBEAN RESEARCH AT ONTARIO IN 1996

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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 be exported to the Orient and provide a raw material for specialized food products. Soybean would also be a valuable rotation crop because of the soil improving qualities of its residues and 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. Hoffman and Fitch in 1972 demonstrated that Evans soybeans adapted to Minnesota could yield 50 to 65 bushels/acre at Ontario. The most productive lines averaged 60-65 bushels/acre for several years. Furthermore, yields were increased by approximately 20 percent for certain cultivars by decreasing row widths to 22 inches. Yields could also be increased by increasing the seeding rate from 200,000 seeds/ac to 300,000 seeds/ac if semidwarf lines were found adapted to local conditions.

Soybean varieties developed for the midwestern and southern states are not necessarily well adapted to Oregon due to lower night temperatures, lower relative humidity, and other climatic differences. Previous research at Ontario has shown that, compared to the commercial cultivars bred for the midwest, plants for 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). There is also a need to identify cultivars that will grow and yield well under high seeding rates and narrow row spacing.

In 1992, 241 single plants were selected from five F_5 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 in 1994 and 1995. This report summarizes work done in 1996 as part of the continuing breeding and selection program to adapt soybeans to eastern Oregon.

Procedures

The 1996 trials were conducted on a Owyhee silt loam previously planted to wheat. The herbicide Dual at 1 lb ai/ac was broadcast preplant and incorporated with a bed

harrow on May 9. Seed was planted on May 24 at 300,000 seeds/acre in rows 22 inches apart. Rhizobium japonicum soil implant inoculant was applied in the seed furrow at planting. Emergence started on May 31. The crop was furrow irrigated as necessary.

Thirteen of the single plant selections from 1992, and eight older cultivars were planted in replicated plots four rows wide by 25 feet long in 1996. The experimental design was a complete randomized block with five replicates. Thirty-four single plant selections made from F_2 lines in 1995 were planted at the same time in single rows 15 feet long. Eight F_2 lines were also planted in single rows on May 31.

Plant height and reproductive stage were measured weekly for each cultivar. Prior to harvest the cultivars were evaluated for lodging and seed shatter. The middle two rows in each four- row plot, and single rows from the single plant selection plots, were harvested on October 28 using a Wintersteiger Nurserymaster small plot combine. The beans were cleaned, weighed, and oven dried for moisture content determination. Dry bean yields were corrected to 13 percent moisture. Single plant selections were selected, cut at ground level, threshed in the small plot combine, and labeled individually. Single plants were selected from the F_2 lines and the seed will be planted and evaluated in 1997. Data were analyzed by analysis of variance. Means separation was determined by the protected least significant difference test.

Results and Discussion

The field had to be irrigated May 29 due to inadequate moisture for emergence. Emergence started on May 31 and was poor for most varieties, resulting in low plant stands (Table 1).

Yields ranged from 14 to 58 bu/ac (Table 1). The older cultivars lodged heavily and took too long to mature or did not reach adequate harvest maturity for efficient combining. Most of the 1992 single plant selections reached physiological maturity in 115 days or less, had no lodging, and had seed sizes large enough for the manufacturing of tofu (< 2,270 seeds/lb).

Higher yields would be achievable with plant stands closer to the planned 300,000 plants/ac and planting date closer to the ideal of May 7. Frost on September 23 complicated the late planting date and reduced yield of late maturing cultivars.

All F_2 lines measured less than 55 cm in height, except HC 35 which was 85 cm tall. No shatter nor lodging was observed for any of the F_2 lines.

Table 1. Performance characteristics of soybean cultivars. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1996.

Cultivar	Days to maturity[z]	Days to harvest maturity[y]	Lodging	Shatter	Height	Stand[w]	Yield	Seed count
	days from emergence		0-10[x]	%	cm	plants/ac	bu/ac	seeds/lb
M92-314	90	98	0	0	74	155,587	57.8	1,962.0
M92-330	90	105	0	0	74	115,786	55.0	2,195.2
M92-213	105	115	0	0	80	155,587	52.3	2,084.1
M92-225	90	98	1	0	76	57,893	51.7	2,195.1
M92-217	105	115	0	0	86	72,366	48.8	1,999.9
M92-220	115	126	2	0	80	130,259	46.3	1,974.0
M92-239	105	115	0	0	85	123,022	44.4	2,226.7
M92-350	90	105	9	0	79	173,678	43.0	2,168.1
M92-237	90	105	0	0	88	47,038	42.1	2,049.4
M92-085	105	115	6	0	70	184,533	41.2	2,030.4
Agassiz	98	126	6	0	76	155,587	38.6	1,984.2
M92-223	115	126	0	0	70	47,038	34.5	1,929.9
Lambert	126	n	7	0	81	249,663	29.4	1,934.4
OR-6	98	105	9	0	97	188,152	25.3	1,984.9
Gnome 85	105	126	8	0	90	126,641	25.3	2,040.4
OR-8	126	n	7	0	78	159,205	22.1	2,055.1
Sibley	126	n	7	0	75	115,786	18.4	1,827.9
Evans	126	n	8	0	70	94,076	14.2	1,971.5
LSD (0.05)							7.5	115.6

[z] Pods yellowing, 50% of leaves yellow. [y] 95% of pods brown, stems dry enough to be combined.