# SOYBEAN RESEARCH AT ONTARIO IN 1997

Erik B. G. Feibert, Clinton C. Shock, and Monty Saunders
Malheur Experiment Station
Oregon State University
Ontario, Oregon, 1997

## 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 soybeans 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 it's $N_2$-fixing capability. Because of the high value of 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 because of 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 were selected for further testing in larger plots in 1994, 1995, and 1996. This report summarizes work done in 1997 as part of the continuing breeding and selection program to adapt soybeans to eastern Oregon.

## Methods

The 1997 trials were conducted on an Owyhee silt loam previously planted to wheat. The herbicide Dual at 1 lb ai/acre was broadcast preplant and incorporated with a bed harrow on May 9.

The seed of each variety was cleaned of broken seed pieces, and the number of seeds with cracked seed coats was determined. The seeding rate for each variety was increased to account for the seeds with cracked seed coats. The seed was treated with Apron fungicide. Seed was planted on May 13 at 300,000 seeds/acre in rows 22

inches apart. Rhizobium japonicum soil implant inoculant was applied in the seed furrow at planting. The field was furrow irrigated on May 14 since there was insufficient moisture for adequate seed germination. Emergence started on May 19. The crop was furrow irrigated as necessary.

Eleven of the single plant selections from 1992 and six 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. All plots were cut to 23 feet. Twenty nine single plant selections made from $F_2$ lines in 1996 were planted at the same time in single rows 15 feet long.

Stand counts were taken from 2 m of one of the middle two rows in each plot on June 24. 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 to determine moisture content. Dry bean yields were corrected to 13 percent moisture. Single-plant selections were made; the plant was cut at ground level and threshed in the small plot combine, and the seed was bagged and labeled individually. Data were analyzed by analysis of variance; means separation was determined by the protected least significant difference test.

## Results and Discussion

Plant stand was well below the target of nearly 300,000 plants/acre for all varieties (Table 1). Probably due to imperfect stands, yields ranged from 30 to 55 bu/acre (Table 1). Higher yields would be achievable with plant stands closer to the planned density of 300,000 plants/acre and a planting date closer to the ideal of May 7.

All the older cultivars lodged heavily, and some 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).

Over the last four years the new selections not only have demonstrated advantages in early maturity, low lodging, and favorable seed characteristics, but also have had average yields that have improved over the initial selections (OR-6 and OR-8) and over the commercial varieties from the midwest (Agassiz, Evans Gnome 85, Lambert, and Sibley).

Table 1. Performance characteristics of new soybean selections compared to established cultivars (Agassiz, Evans Gnome 85, Lambert, and Sibley), Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1997.

| Cultivar | Days to maturity[1] | Days to harvest maturity[2] | Lodging | Shatter | Height | Stand[3] | Yield | Seed count |
|---|---|---|---|---|---|---|---|---|
| | days from emergence | | 0-10[4] | % | cm | plants/acre | bu/acre | seeds/lb |
| M92-217 | 112 | 120 | 0 | 0 | 80 | 153,528 | 55.2 | 2000 |
| M92-220 | 112 | 120 | 0 | 0 | 85 | 129,630 | 54.6 | 1974 |
| Lambert | 112 | 120 | 6 | 0 | 105 | 137,596 | 53.5 | 1934 |
| M92-085 | 100 | 112 | 0 | 0 | 80 | 121,664 | 50.0 | 2030 |
| M92-213 | 112 | 120 | 0 | 0 | 100 | 139,769 | 49.9 | 2084 |
| M92-350 | 100 | 112 | 0 | 0 | 100 | 137,596 | 49.9 | 2168 |
| M92-314 | 112 | 120 | 0 | 0 | 80 | 144,114 | 49.2 | 1962 |
| M92-237 | 100 | 112 | 0 | 0 | 70 | 134,699 | 48.5 | 2049 |
| Agassiz | 112 | 120 | 3 | 0 | 70 | 118,767 | 46.0 | 1984 |
| M92-223 | 114 | n | 4 | 0 | 110 | 115,870 | 45.5 | 1930 |
| M92-330 | 100 | 112 | 0 | 0 | 65 | 138,320 | 44.7 | 2195 |
| M92-225 | 100 | 112 | 0 | 0 | 60 | 134,699 | 43.7 | 2195 |
| OR-6 | 112 | 120 | 3 | 0 | 85 | 133,251 | 43.6 | 1985 |
| M92-239 | 112 | 120 | 0 | 0 | 65 | 142,665 | 42.0 | 2227 |
| Gnome 85 | 112 | 120 | 7 | 0 | 100 | 118,767 | 41.8 | 2040 |
| OR-8 | 120 | n | 8 | 0 | 105 | 132,527 | 34.2 | 2055 |
| Evans | 120 | n | 8 | 0 | 100 | 127,457 | 29.9 | 1972 |
| Sibley | 120 | n | 9 | 0 | 60 | 131,803 | 29.7 | 1828 |
| LSD (0.05) | | | | | | NS | 7.8 | 116 |

[1] Pods yellowing, 50% of leaves yellow. [2] 95% of pods brown, stems dry enough to be combined.
[3] average of counts in 2m of row in each rep.
[4] 0= none, 10= 100 percent lodging. n= never reached harvest maturity.

Table 2. Four year average yields of new soybean selections compared to released cultivars, Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1997.

| Cultivar | Yield | | | | |
|---|---|---|---|---|---|
| | 1994 | 1995 | 1996 | 1997 | Average |
| | ---------- bu/acre ---------- | | | | |
| M92-314 | 63.2 | 48.9 | 57.8 | 49.2 | 54.8 |
| M92-220 | 62.0 | 49.6 | 46.3 | 54.6 | 53.1 |
| M92-350 | 63.6 | 55.2 | 43.0 | 49.9 | 52.9 |
| M92-330 | 57.8 | 51.1 | 55.0 | 44.8 | 52.2 |
| M92-225 | 62.8 | 49.1 | 51.7 | 43.7 | 51.8 |
| M92-213 | 61.2 | 43.4 | 52.3 | 49.9 | 51.7 |
| M92-237 | 63.1 | 50.6 | 42.1 | 48.5 | 51.1 |
| M92-085 | 63.3 | 48.7 | 41.2 | 50.0 | 50.8 |
| M92-217 | 35.7 | 49.3 | 48.8 | 55.2 | 47.3 |
| Lambert | 69.6 | 31.7 | 29.4 | 53.6 | 46.1 |
| Agassiz | 62.4 | 36.3 | 38.6 | 46.0 | 45.8 |
| M92-223 | 45.6 | 55.3 | 34.5 | 45.5 | 45.2 |
| M92-239 | 47.8 | 42.2 | 44.4 | 42.0 | 44.1 |
| Gnome 85 | 67.0 | 32.6 | 25.3 | 41.8 | 41.7 |
| OR-8 | 66.3 | 34.0 | 22.1 | 34.2 | 39.2 |
| OR-6 | 58.2 | 28.2 | 25.3 | 43.6 | 38.8 |
| Sibley | 64.3 | 24.0 | 18.4 | 29.7 | 34.1 |
| Evans | 68.6 | 13.2 | 14.2 | 29.9 | 31.5 |
| LSD (0.05) | 7.1 | 14.1 | 7.5 | 7.8 | |