

SUGAR BEET VARIETY TRIAL RESULTS

Clinton C. Shock, Eric P. Eldredge, and Monty Saunders
Malheur Experiment Station
Oregon State University
Ontario, Oregon, 1999

Introduction

Sugar beet seed companies, the beet growers associations, and the Amalgamated Sugar Co. have cooperated with OSU for many years to test sugar beets at the Malheur Experiment Station. Commercial cultivars and experimental lines of sugar beets were evaluated to identify lines with high sugar yields and root quality. A joint seed advisory committee consisting of grower association and industry representatives evaluates the performance data for the varieties over several years and locations. The committee restricts planting to only those varieties meeting established industry standards.

Procedures

Twenty-two commercial cultivars and 29 experimental lines (including check cultivars) of sugar beets were evaluated in separate trials conducted at the Malheur Experiment Station, Ontario, Oregon. Sugar beets were planted in Owyhee silt loam where winter wheat had been grown the previous year. Fields were plowed in the fall of 1998, bedded on 22-in rows, and fumigated with 20 gal/acre of Telone C-17 on November 6, 1998. The March 4 soil test results in the first foot of soil were 2 ppm of nitrate-N and 6 ppm of ammonium-N, and in the second foot were 3 ppm of nitrate-N and 5 ppm of ammonium-N. Extractable phosphorus was 28 ppm, and exchangeable Zn was 0.9 ppm. Soil pH was 7.6 and soil organic matter was 1.2 percent. On April 1, Nortron SC herbicide was applied at 6 pints per acre and incorporated using a spike-tooth bed harrow before planting.

The seed for both trials was planted on April 2 with cone-seeders mounted on a John Deere model 71 flexi-planter equipped with disc openers. Each entry was replicated eight times in a randomized complete block experimental design. Each plot was four rows wide and 22 ft long with 5-ft alleys separating plots. Approximately 12 viable seeds/ft of row were planted in each plot row. On April 6, the furrows were corrugated, and Counter 15G was applied in a band over the row at 6 oz/1,000 ft of row. The sugar beets were furrow-irrigated for uniform seedling emergence. The sugar beets were hand-thinned May 21-22 to achieve 6.6-in spacing between plants. On April 30, Betamix Progress was applied at 1.13 pt/acre, in a tank mix with Poast at 1 pint per acre. The sugar beets were sidedressed with urea to apply 230 lb N/acre on May 27.

Powdery mildew was controlled with 30 lb/acre of sulfur dust applied on July 3, another 30 lb/acre applied on August 4, and Super 6 sulfur plus Lannate applied on August 30, all by airplane.

Sugar beets from the commercial cultivars were harvested on October 12-13, and those from the experimental trial were harvested on October 14-15. The foliage was removed with a flail beater, and the crowns were clipped with rotating scalping knives. Beets from the two center rows of each four-row plot were dug with a single-row, wheel-type lifter harvester, and all roots in each 22 ft of row were weighed. Root yields were corrected by 5 percent tare. A sample of eight beets was taken from each of the harvested rows and analyzed by Amalgamated Sugar, Nyssa tare lab for percentage of sucrose (Sug), pulp nitrate nitrogen, and conductivity (Cond). The percent extraction was calculated using the formula:

$$\text{Ext} = 250 + ((1255.2 * \text{Cond}) - (15000 * \text{Sug}) - 6185) / \text{Sug} * (98.66 - 7.845 * \text{Cond}).$$

Varietal differences were calculated using ANOVA and Fisher's protected least significant differences test at the 5 percent level, LSD (0.05). Beet performance in each trial was compared with the established commercial varieties ACH 211, Beta 8422, HM Owyhee, and HM PM21. Cultivar performance was analyzed statistically and ranked by recoverable sugar within each company's entries.

Results

The 1999 trials suffered stand losses from unfavorable weather conditions for seedling emergence and pigeon and pheasant predation of seedlings, resulting in more variable stand than what is ideal. The damage was most severe in the seventh and eighth replicates, which were eliminated from consideration in the statistical analyses.

The commercial cultivars trial averaged 17.99 percent sucrose, with a range of root yield from 45 to 33 ton/acre (Table 1). Yields of estimated recoverable sugar from commercial cultivars ranged from a high of 13,800 lb/acre to a low of 10,600 lb/acre, with a trial mean of 12,700 lb/acre of sugar. Beta 8220, ACH Tomcat, HM Gem, HM Oasis, ACH Mustang, Beta 4035R, HM Owyhee, HM Dillon, HM Emblem, HH120, and HM Sierra were among the top yielding commercial cultivars, based on estimated recoverable sugar per acre.

Root tonnage among the experimental lines ranged up to 50 ton/acre, after 5 percent tare deduction (Table 2). The experimental lines' sucrose percentage averaged 18.12. Yield of recoverable sugar from the experimental lines ranged from 15,200 lb/acre to a low of 11,900 lb/acre, with an entry mean of 13,100 lb/acre of sugar. HM2982, HM1642, Seedex 1514, and 97HX706 were among the top yielding experimental cultivars, based on estimated recoverable sugar per acre.

Table 1. Root yields, sugar yields, and root quality from sugar beet lines entered as commercial lines at the Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1999.

Variety	Root yield ton/acre	Sugar %	Gross sugar lb/acre	Conduct. mmho	Extraction %	Est. Rec. lb/ton	Est. Rec. lb/acre
American Crystal							
ACH Tomcat	44.0	18.03	15,800	0.63	86.79	313	13,700
ACH Mustang	42.0	17.88	15,000	0.68	86.07	308	12,900
ACH Crystal211	38.8	18.39	14,300	0.58	87.50	322	12,500
Betaseed							
Beta 8220	45.3	17.61	15,900	0.66	86.25	304	13,800
Beta 4035R	43.0	17.80	15,300	0.66	86.30	307	13,200
Beta 8919	38.9	18.87	14,700	0.66	86.49	326	12,700
Beta 8348	41.6	17.60	14,600	0.63	86.70	305	12,700
Beta 8757	40.2	18.19	14,600	0.68	86.14	313	12,600
Beta 8118	39.7	18.12	14,400	0.65	86.49	313	12,400
Beta 8468	39.6	17.61	13,900	0.68	86.04	303	12,000
Beta 8422	38.4	18.07	13,900	0.72	85.56	309	11,900
Beta 4470R	33.4	18.42	12,300	0.70	85.94	317	10,600
Hilleshog Mono Hy							
HM Gem	44.5	17.64	15,700	0.62	86.85	306	13,600
HM Oasis	42.3	18.22	15,400	0.57	87.61	319	13,500
HM Owyhee	41.9	17.98	15,100	0.57	87.56	315	13,200
HM Dillon	41.8	17.67	14,800	0.56	87.60	310	12,900
HM Emblem	40.7	17.95	14,600	0.51	88.24	317	12,900
HM Sierra	40.7	18.06	14,700	0.62	86.92	314	12,800
HM Canyon	41.5	17.67	14,700	0.66	86.31	305	12,700
HM PM21	39.0	18.07	14,100	0.58	87.41	316	12,300
Holly Hybrids							
HH120	41.0	18.16	14,900	0.70	85.92	312	12,800
Seedex							
SX Blazer	35.7	17.80	12,700	0.68	85.74	305	10,900
Mean	40.6	17.99	14,600	0.635	86.66	311.8	12,700
LSD (0.05)	3.3	0.37	1,140	0.038	0.55	7.5	1,030

Table 2. Root yields, sugar yields, and root quality from sugar beet lines entered as experimental lines at the Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1999.

Variety	Root Yield ton/acre	Sugar %	Gross sugar lb/acre	Conduct. mmho	Extraction %	Est. Rec. lb/ton	Est. Rec. lb/acre
American Crystal							
ACH211	39.9	18.49	14,800	0.57	87.62	324	12,900
ACH9906	40.5	18.11	14,700	0.63	86.71	314	12,700
ACH9901	38.9	18.62	14,500	0.61	87.11	324	12,600
Betaseed							
Beta5KJ5017	42.9	18.39	15,800	0.65	86.57	318	13,700
Beta8570	41.4	18.68	15,500	0.68	86.28	322	13,300
Beta7KJ5109	41.2	18.18	15,000	0.60	87.12	317	13,000
BetaKJ5073	40.7	18.09	14,700	0.70	85.84	311	12,700
Beta8422	39.9	18.11	14,400	0.69	85.57	310	12,400
Beta7CG7015	39.2	18.21	14,300	0.67	86.22	314	12,300
Beta5CG7347	38.1	18.29	13,900	0.59	87.35	320	12,200
Beta7CG7022	38.3	18.38	14,000	0.66	86.46	318	12,100
Hilleshog Mono Hy							
HM2982	50.4	17.50	17,500	0.65	86.39	301	15,200
HM1642	44.0	18.56	16,400	0.59	87.42	325	14,300
HM2980	44.9	17.70	15,900	0.71	85.63	303	13,600
HM PM21	42.3	18.11	15,300	0.57	87.59	317	13,400
HM Owyhee	42.8	17.96	15,400	0.59	87.21	313	13,400
HM2930	42.6	18.29	15,300	0.61	87.64	314	13,400
HM2931	41.3	18.34	15,200	0.56	87.65	321	13,300
HM2932	44.5	17.82	15,200	0.61	86.85	297	13,200
HM PM15	40.4	18.16	14,700	0.57	87.56	318	12,900
HM2981	37.2	18.54	13,800	0.63	86.78	322	12,000
Holly Hybrids							
97HX706	43.7	18.48	16,200	0.60	87.28	323	14,100
99HX905	42.9	18.07	15,500	0.62	86.93	314	13,500
99HX902	44.8	17.32	15,500	0.62	86.73	300	13,400
98HX802	44.8	17.26	15,300	0.67	86.01	295	13,200
99HX901	40.7	18.33	14,900	0.65	86.52	317	12,900
Seedex							
SX1514	45.1	17.87	16,100	0.50	88.43	316	14,200
SX1515	41.9	17.80	14,900	0.57	87.47	311	13,000
SX1513	38.7	17.67	13,600	0.55	87.71	308	12,000
Mean	41.9	18.12	15,100	0.617	86.92	314.1	13,100
LSD (0.05)	3.4	0.29	1,240	0.049	0.69	9.4	1,070