

## SUGAR BEET VARIETY TRIAL RESULTS

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### Introduction

Sugar beet seed companies and the beet growers associations have cooperated 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 evaluates the accumulated performance data for the varieties over several years and locations, then it restricts growers in Idaho and Malheur County of Oregon to planting only those varieties ranking above minimum industry requirements.

### Procedures

Twenty-eight commercial cultivars and 28 experimental lines (including check cultivars) of sugar beets were evaluated in separate trials conducted at the Malheur Experiment Station, Ontario, OR. Sugar beets were planted in Owyhee silt loam where winter wheat had been grown the previous year. Fields were plowed in the fall of 1997, bedded on 22-in rows and fumigated with 20 gal/acre of Telone C-17 on November 6, 1998. The March 10 test results in the first foot of soil were 2 ppm of nitrate-N and 7 ppm of ammonium-N, and in the second foot were 7 ppm of nitrate-N and 7 ppm of ammonium-N. Extractable phosphorus was 22 ppm, and exchangeable Zn was 1.5 ppm. Soil pH was 7.0 and soil organic matter was 1.5 percent. On April 13 the beds were prepared using a spike-tooth bed harrow before planting.

Each entry was replicated eight times using a randomized complete block experimental design. Each plot was four rows wide and 23 ft long with 4-ft alleys separating plots. Approximately 12 viable seeds per foot of row were planted in each plot row. The seed was planted on April 16 with cone-seeders mounted on a John Deere model 71 flexi-planter equipped with disc openers. On April 17, trials were corrugated, and Counter 15G was applied in a band over the row at 6 oz/1000 ft of row. The sugar beet trials were furrow-irrigated to furnish moisture for uniform seedling emergence. The sugar beets were hand-thinned May 16-18; spacing between plants was approximately 7 in. On May 28, 30 lb N/acre broadcast urea was applied by hand following an unusually rainy May with 4.5 in of rain. The crop was sidedressed with 189 lb N/acre as urea on June 3. The crop was severely hurt by hail on July 4.

Treflan at 1 pt/acre was applied for weed control June 10 and incorporated with sinner weeders. Beets were mechanically cultivated for the last time on June 30, and were recoruggated a final time on July 30. A hailstorm defoliated the sugarbeets and flooded the field temporarily on the evening of July 4. Powdery mildew was controlled with 60 lb/acre of sulfur dust on July 31 and August 18, and with Bayleton at 1 lb/acre on August 18, all applied by airplane.

Sugar beets from the commercial cultivars were harvested October 27-28, and those from the experimental trial were harvested October 28-29. The foliage was removed by 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 23 ft of row were weighed and corrected by 5 percent tare to calculate root yields. A sample of eight beets was taken from each of the harvested rows and analyzed by Amalgamated Sugar Company 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 protected least significant differences at the 5 percent level, LSD (0.05). Performance was compared with the established commercial varieties ACH 211, Beta 8422, HM Owyhee, and HM PM21.

### Results

Cultivar performance was analyzed statistically and ranked by recoverable sugar within each company's entries (Tables 1 and 2). It was not possible to evaluate the yield losses from severe hail on July 4. Yields of estimated recoverable sugar from commercial cultivars ranged from a high of 11,886 lb/acre of sugar to a low of 8838 lb/acre of sugar, with a variety mean of 10,571 lb/acre of sugar. Among the top yielding commercial cultivars were HM Owyhee, HM Canyon, HM Dillon, Beta 8450, and Beta 8118 (Table 1).

Root tonnage among the experimental lines ranged up to 45.4 ton/acre. The experimental lines sucrose percentage averaged 17.27 compared to 17.43 for the commercial cultivars. Yield of recoverable sugar from the experimental lines ranged from 12,725 lb/acre of sugar to a low of 9,470 lb/acre of sugar, with an entry mean of 11,285 lb/acre of sugar. Among the top yielding lines were the Betaseed 5KG 6910, Holly HH97HX724 and HH98HX802 (Table 2).

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, OR, 1998.

Seed company	Variety	Root yield	Sucrose	Gross sugar	Conductivity	Extraction	Estimated recoverable sugar	
		ton/acre	%	lb/acre	mmho	%	lb/ton	lb/acre
Hilleshog	Canyon	39.04	17.57	13728	0.78	84.74	298	11637
	Sierra	37.51	17.72	13298	0.72	85.56	303	11381
	Pillar	30.58	18.12	11082	0.71	85.73	311	9503
	Oasis	36.19	17.64	12776	0.68	86.03	303	10998
	PM21	37.29	17.62	13162	0.69	85.89	303	11311
	Emblem	36.31	17.87	12983	0.66	86.28	308	11200
	Owyhee	39.04	17.76	13865	0.71	85.72	304	11886
	Dillon	38.73	17.43	13499	0.72	85.44	298	11537
	Cassia	37.23	17.57	13093	0.71	85.58	301	11208
	HM9155	36.99	17.08	12641	0.85	83.66	286	10582
	HMWS62	34.44	17.30	11909	0.75	85.00	294	10127
PM9	39.50	16.98	13418	0.72	85.39	290	11459	
American Crystal	ACH203	34.44	17.44	12016	0.76	84.92	296	10205
	ACH211	33.58	17.96	12070	0.71	85.69	308	10344
	Mustang	38.31	17.56	13457	0.80	84.43	297	11363
	Tomcat	37.42	17.43	13059	0.83	84.04	293	10978
Holly	Rival	30.27	17.51	10599	0.75	85.08	298	9019
	Rizor	30.52	17.23	10539	0.84	83.88	289	8838
	SS781R	32.11	16.64	10681	0.84	83.78	279	8951
Seedex	Blazer	34.41	17.28	11891	0.85	83.66	289	9953
Betaseed	Beta8118	35.58	17.74	12614	0.85	83.80	297	10572
	Beta8450	35.91	17.22	12367	0.90	83.10	286	10277
	Beta8422	35.15	16.93	11903	0.91	82.88	281	9865
	Beta8468	35.42	17.65	12511	0.86	83.68	295	10472
	Beta8757	36.50	17.14	12509	0.88	83.25	285	10413
	Beta8348	37.63	16.90	12711	0.84	83.77	283	10647
	Beta4035R	36.56	17.23	12601	0.82	84.15	290	10608
	Beta4546	35.82	17.62	12624	0.80	84.41	298	10655
mean		35.80	17.43	12486	0.78	84.63	295	10571
LSD 0.05		3.41	0.11	1243	0.05	0.74	7	1079

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, OR, 1998.

Seed company	Variety	Root yield	Sucrose	Gross sugar	Conductivity	Extraction	Estimated recoverable sugar	
		ton/acr	%	lb/acre	mmho	%	lb/ton	lb/acre
Hilleshog	PM21	40.45	17.37	14047	0.69	85.79	298	12050
	Owyhee	41.56	17.16	14265	0.81	84.28	289	12023
	HM2977	40.64	16.74	13628	0.71	85.42	286	11622
	HM2980	39.87	17.06	13606	0.86	83.60	285	11380
	HM2981	39.35	17.13	13473	0.80	84.33	289	11362
	HM1329	39.44	17.51	13786	0.82	84.14	295	11593
American Crystal	ACH211	35.97	17.78	12790	0.75	85.17	303	10893
	ACH9707	33.98	17.52	11909	0.72	85.53	300	10187
	ACH9802	36.25	17.14	12415	0.84	83.77	287	10398
Seedex	SX1512	39.78	16.64	13228	0.69	85.74	285	11339
	SX1513	40.70	16.41	13355	0.69	85.62	281	11436
Betaseed	Beta8422	37.35	17.00	12686	0.92	82.76	281	10501
	4KG5983	38.49	18.18	13983	0.81	84.48	307	11812
	4KG5996	39.47	17.60	13885	0.86	83.59	294	11609
	5CG7347	36.89	17.83	13155	0.74	85.27	304	11217
	5KG6910	45.42	16.72	15182	0.84	83.80	280	12725
	6CG7125	39.41	17.20	13555	0.91	82.94	285	11240
	6CG7128	37.94	17.41	13200	0.89	83.22	290	10985
	5KJ5017	39.90	17.37	13863	0.87	83.49	290	11577
	6CG7265	40.02	17.08	13654	0.89	83.10	284	11347
7CG7382	35.73	16.46	11751	1.07	80.58	265	9470	
Holly	H943222	37.94	16.80	12739	0.82	84.02	282	10705
	HH97HX706	37.60	18.18	13664	0.64	86.68	315	11844
	HH97HX724	41.80	17.35	14498	0.87	83.47	290	12104
	HH98HX802	39.72	17.95	14241	0.70	85.77	308	12213
	HH98HX803	36.37	17.57	12771	0.75	85.13	299	10864
	HH98HX804	38.00	15.71	11923	0.92	82.40	259	9822
	HH98HX805	36.25	18.59	13473	0.65	86.62	322	11670
mean	38.80	17.27	13383	0.80	84.31	291	11285	
LSD 0.05	2.42	0.53	888	0.06	0.84	10	759	