SUGAR BEET VARIETY TRIALS 2008

Lamont D. Saunders and Clinton C. Shock
Malheur Experiment Station
Oregon State University
Ontario, OR

Introduction

The sugar beet industry in southern Idaho and eastern Oregon, in cooperation with Oregon State University, tests sugar beet varieties at multiple locations each year to identify varieties with high sugar yield and root quality. A seed advisory committee evaluates the data each year to select the best varieties for sugar production. This report provides the agronomic practices and results for the Malheur Experiment Station location of the 2008 trials.

Methods

The 2008 sugar beet trials are grown on Owyhee silt loam soil where winter wheat was the previous crop. The wheat stubble was shredded and the field was irrigated and disked. Soil analysis showed pH of 7.8, very low total nitrates at 8 ppm, low sulfates at 12 ppm, very low manganese at 3 ppm, and very low iron at 6 ppm. All other elements were adequate. Based on soil analyses and estimated crop needs, the field was fertilized with 50 lb/acre N, 30 lb/acre P_2O, 46 lb/acre S as sulfate, 100 lb/acre elemental S, 5 lb/acre Zn, 6 lb/acre Mn, and 2 lb/acre B on September 28, 2007. The field was ripped, plowed, and ground hogged before the field was bedded in 22-inch beds and Telone® C17 was injected at 15 gal/acre on November 27, 2007.

Sugar beets were planted on April 3, 2008 at a seeding rate of 8 viable seed/ft of row. Plots of each variety were 4 rows wide (22-inch row spacing) by 23 ft long, with a 3-ft alley separating each tier of plots. Each entry was replicated eight times in a randomized complete block design.

On April 11, Counter® 15G was applied in a band over each row at 7.4 lb/acre. The first irrigation was on April 12. Soil moisture was monitored using Watermark soil moisture sensors. Soil moisture is maintained at a soil water tension wetter than 70 centibars at 8-inch depth in the beet row for the duration of the season.

Beets began to emerge on April 17, and were fully emerged by April 26. The entire trial was broadcast sprayed with Roundup WeatherMax® at 22 oz/acre on May 4 when beets were in the two true-leaf stage. Seedlings were thinned by hand to one plant per 7 inches on May 19. On June 02, urea was side dressed to supply 170 lb N/acre.

The field was side dressed with Temik® at 10 lb/acre on June 2 and irrigated on June 3 to control sugar beet root maggot. On June 9, the trial was broadcast sprayed with

Roundup WeatherMax at 22 oz/acre. Roundup PowerMax™ at 22 oz/acre was sprayed on July 2. This application was made using 110-degree flat-fan spray nozzles mounted on the back of corrugator slicks with the spray directed upwards. This directional spray facilitated getting the herbicide under the canopy and was effective in spraying the weeds that had escaped because they had been protected overhead by the sugar beet canopy.

Petiole tests were taken on July 3, July 16 and August 18. Based on petiole analyses, boron was water run at 0.2 lb/acre on July 18. To control powdery mildew, Headline® fungicide at 12 oz/acre was applied on July 15 and August 7, Enable® fungicide was applied at 8 oz/acre with 4 lb S/acre on July 29 and September 3, and Topsin M® fungicide at 1 lb/acre was applied on August 15.

Sugar beets were harvested on October 14 and 15. The foliage was flailed and the crowns were removed with rotating disks. All sugar beets in the center two rows of each plot were dug with a two-row wheel-lifter harvester and weighed, and two eight-beet samples were taken from each plot. Samples were transported daily to the Snake River Sugar factory for laboratory analysis of sucrose, nitrate, and conductivity. The root-weight data were examined for outliers as is customary for calculations of sugar beet variety data in these trials. Observations more than two standard deviations from the mean for each variety were deleted. Sugar sample data were checked for errors in sugar percentages and conductivity. Any erroneous sample readings were deleted from the data set.

The weight of sugar beets from each plot was multiplied by 0.90 to estimate tare. Sugar concentrations were "factored" by multiplying measured sucrose by 0.98 to estimate the sugar that would have been lost to respiration if the beets had been stored in a pile. The data for each plot with two samples were averaged for analysis. The percent extraction was calculated using the formula:

$$Ext = 250 + [(1{,}255.2 * Cond) - (15{,}000 * Sug) - 6{,}185] / Sug * (98.66 - 7.845 * Cond)$$

where Ext is percent extraction, Cond is the electrical conductivity in mmho, and Sug is the percent sucrose concentration.

Variety differences in yield, sucrose content, conductivity, percent extraction, and estimated recoverable sugar were calculated using least-squares means analysis. The varieties were listed in the tables of results in descending order of estimated recoverable sugar. Reports of previous years' Oregon State University variety trials are available online at www.cropinfo.net.

Results

Variety results were grouped by estimated recoverable sugar. The root weights were tared 10 percent, as explained above. Root yield for beet varieties in the Commercial Trial averaged 47.48 tared ton/acre and 16.09 percent sugar content (Table 1). Varieties with the highest root yield in the Commercial Trial included 'BTS 25RR06'

(51.75 ton/acre), 'BTS 27RR10', 'BTS 26RR11', 'BTS 25RR07' and 'BTS 26RR17'. Varieties among those with the highest recoverable sugar per acre were 'BTS 27RR10' (14,081 lb/acre), 'HM 9023RR', and 'BTS 25RR06'.

Root yield in the Experimental Trial averaged 45.62 tared ton/acre and 16.19 percent sugar content (Table 2). Varieties with the highest root yield included 'Crystal RR835' (52.82 ton/acre), 'Crystal RR876', 'HM 9126RR', and 'HM 9036RR'. Varieties with the highest recoverable sugar per acre were 'HM 9126RR' (14,153 lb/acre), 'Crystal RR835', 'HM 9036RR', 'HM 9122RR', 'BTS 27RR20', 'Crystal RR876', 'Crystal RR892', and 'SV36803RR'.

Table 1. Commercial Roundup Ready sugar beet variety performance in the Amalgamated Sugar Co. LLC Variety Trial at the Oregon State University Malheur Experiment Station, Ontario, Oregon, 2008.

VARIETY	Root yield (ton/acre)	Sugar content (%)	Gross sugar (lb/acre)	Conduc-tivity (mmhos)	Extrac-tion (%)	Estimated recoverable sugar (lb/ton)	Estimated recoverable sugar (lb/acre)		Powdery mildew resistance (0-9)
BTS 27RR10	50.77	16.29	16,538	0.727	85.15	277.4	14,081	a	4.9
HM 9023RR	48.29	16.65	16,082	0.746	84.98	283.0	13,670	ab	4.2
BTS 25RR06	51.75	15.61	16,126	0.829	83.62	261.2	13,491	abc	3.8
BTS 26RR11	49.86	15.71	15,654	0.783	84.29	265.0	13,195	bcd	4.3
BTS 26RR17	49.25	15.93	15,691	0.823	83.80	267.0	13,141	bcd	4.5
SV36601RR	48.99	15.84	15,513	0.814	83.91	265.8	13,018	bcd	5.1
Crystal RR989	46.57	16.63	15,491	0.846	83.64	278.3	12,958	bcd	3.8
BTS 26RR13	47.18	16.22	15,290	0.781	84.43	273.9	12,906	cd	4.9
BTS 26RR14	48.55	15.66	15,203	0.795	84.11	263.5	12,793	cde	4.5
BTS 25RR07	49.57	15.36	15,234	0.832	83.55	256.7	12,730	de	4.3
Crystal RR968	45.88	16.39	15,028	0.786	84.40	276.6	12,683	de	5.5
SX1571 RR	47.04	16.06	15,105	0.842	83.56	268.4	12,633	de	4.4
HM 9008RR	45.21	16.41	14,834	0.736	85.06	279.2	12,617	de	3.6
SV36603RR	46.89	15.89	14,900	0.789	84.24	267.8	12,554	de	4.8
HM 9009RR	45.15	16.37	14,794	0.761	84.73	277.5	12,538	de	4.4
Crystal RR966	43.23	17.14	14,820	0.819	84.09	288.3	12,469	de	3.8
BTS 25RR05	45.38	16.03	14,556	0.852	83.43	267.4	12,134	ef	5.3
SV36602RR	45.49	15.39	14,004	0.834	83.54	257.2	11,700	f	4.6
Average	47.48	16.09	15,273	0.800	84.14	271.0	12,853		
LSD (0.05)	2.67	0.41	856	NS	1.15	8.9	755		0.5

Table 2. Experimental Roundup Ready sugar beet variety performance in the Amalgamated Sugar Co. LLC Variety Trial at the Oregon State University Malheur Experiment Station, Ontario, Oregon, 2008.

VARIETY	Root yield (ton/acre)	Sugar content (%)	Gross sugar (lb/acre)	Conduc-tivity (mmhos)	Extrac-tion (%)	Estimated recoverable sugar (lb/ton)	Estimated recoverable sugar (lb/acre)		Powdery mildew resistance[1] (0-9)
HM 9126RR	51.83	16.00	16,580	0.704	85.38	273.3	14,153	a	1.8
Crystal RR835	52.82	15.73	16,606	0.768	84.48	265.7	14,031	ab	3.9
HM 9036RR	51.08	15.78	16,109	0.733	84.96	268.1	13,686	abc	5.2
HM 9122RR	48.75	16.27	15,873	0.694	85.58	278.4	13,586	a-d	1.5
BTS 27RR20	46.42	17.04	15,814	0.695	85.72	292.2	13,557	a-d	4.2
Crystal RR876	52.23	15.53	16,215	0.852	83.31	258.8	13,505	a-d	4.5
Crystal RR892	47.62	16.63	15,832	0.736	85.10	283.1	13,477	a-e	4.0
SV36803RR	49.31	16.09	15,863	0.777	84.45	271.7	13,394	a-f	4.7
HM 9119RR	48.87	15.95	15,582	0.703	85.38	272.4	13,302	b-g	1.8
HM 9127RR	48.43	15.93	15,425	0.729	85.04	270.9	13,119	c-h	3.0
SV36601RR	48.41	15.92	15,418	0.776	84.42	268.9	13,016	c-i	4.8
BTS 28RR04	46.66	16.39	15,282	0.782	84.45	276.8	12,908	d-j	4.6
HM 9121RR	46.23	16.34	15,091	0.735	85.05	277.9	12,828	d-k	3.8
SX1583 RR	47.97	15.85	15,205	0.833	83.64	265.1	12,718	e-l	5.0
SV36801RR	46.40	16.07	14,917	0.734	85.02	273.3	12,682	f-m	4.7
HM 9137RR	45.85	16.20	14,854	0.724	85.17	276.0	12,648	f-m	3.5
Crystal RR846	43.26	16.91	14,621	0.679	85.91	290.6	12,560	g-n	4.0
Crystal RR880	43.38	16.73	14,512	0.634	86.45	289.2	12,546	g-n	4.9
Crystal RR870	44.25	16.77	14,854	0.827	83.93	281.6	12,475	h-o	3.9
BTS 28RR24	43.81	16.63	14,573	0.724	85.25	283.6	12,428	h-o	4.5
HM 9128RR	46.25	15.98	14,758	0.814	83.93	268.2	12,384	h-p	3.0
HM 9008RR	45.01	16.17	14,560	0.744	84.91	274.7	12,362	h-p	4.4
SV36804RR	45.69	15.96	14,587	0.769	84.53	269.8	12,334	i-p	4.6
Crystal RR919	44.71	16.12	14,420	0.714	85.28	275.0	12,293	i-p	5.6
HM 9120RR	45.12	16.04	14,481	0.765	84.59	271.4	12,253	i-q	4.1
HM 9047RR	44.28	16.18	14,329	0.716	85.26	275.9	12,220	j-q	6.4
SX1581 RR	44.74	16.02	14,331	0.779	84.39	270.3	12,090	j-q	4.2
Crystal RR929	43.12	16.57	14,291	0.775	84.58	280.3	12,087	k-q	7.0
HM 9118RR	42.86	16.50	14,128	0.751	84.88	280.1	11,983	l-q	3.8
BTS 26RR11	46.14	15.44	14,237	0.796	84.04	259.6	11,966	l-q	5.1
SV36805RR	44.86	15.82	14,193	0.798	84.11	266.2	11,940	m-q	4.6
HM 9124RR	40.82	16.92	13,808	0.641	86.39	292.4	11,927	m-q	5.3
HM 9026RR	42.74	16.42	14,038	0.784	84.42	277.3	11,854	n-q	4.4
BTS 28RR34	44.16	15.80	13,955	0.750	84.74	267.8	11,827	n-r	5.3
Crystal RR968	43.60	16.09	14,034	0.795	84.21	271.0	11,820	n-r	6.0
BTS 28RR4N	41.98	16.45	13,809	0.755	84.82	279.1	11,712	o-r	5.6
SV36802RR	42.42	16.11	13,671	0.734	85.02	274.0	11,627	p-s	5.2
HM 9117RR	42.10	16.25	13,682	0.811	84.03	273.2	11,498	qrs	3.3
BTS 28RR54	40.33	16.36	13,193	0.814	84.00	275.0	11,087	rs	7.4
SX1582 RR	41.90	15.40	12,901	0.782	84.23	259.4	10,867	s	4.6
Average	45.62	16.19	14,755	0.753	84.78	274.5	12,511		
LSD (0.05)	2.73	0.37	895	0.070	0.95	8.0	767		0.6

[1]Powdery mildew ratings: 0 = no powdery mildew symptoms; 9 = 100% plant coverage.
Correlation with root yield: r = -0.004. Correlation with sugar content: r = -0.210.