

SUGAR BEET VARIETY TRIALS 2009

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 sugar beet variety performance 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 2009 trials.

Methods

Commercial varieties and new experimental varieties were evaluated in two separate trials at the Oregon State University Malheur Experiment Station at Ontario. The experimental variety trial contained four commercial varieties as checks. The 2009 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 from the top foot had a pH of 7.8, 16 lb available nitrogen (N)/ acre, low sulfate at 14 ppm, and low manganese (Mn) at 4 ppm. All other elements were adequate. Based on soil analyses and estimated crop needs, the field was fertilized with 100 lb/acre elemental sulfur (S), 5 lb/acre zinc (Zn), 5 lb/acre Mn, and 1 lb/acre boron (B) on October 7, 2008. 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, 2008.

Sugar beets were planted on April 6, 2008 at a seeding rate of 8 viable seed/ft of row. Plots of each variety are 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 14, Counter[®] 15G (15 percent terbufos) was applied in a band over each row at 7.4 lb/acre. Beets began to emerge on April 16, and were fully emerged by April 27. Soil moisture was monitored using Watermark soil moisture sensors. Soil moisture was maintained at a soil water tension wetter than 70 centibars at 8-inch depth in the beet row for the duration of the season.

On May 16 when beets were at the 6-true-leaf stage, the entire trial was broadcast sprayed with Roundup Original Max[®] (48.7 percent glyphosate) at 32 oz/acre in a

solution containing 5 percent ammonium sulfate (AMS) as well as a non-ionic surfactant and at a spray rate of 25 gal of water/acre. Seedlings were thinned by hand to one plant every 7 inches on May 26. On June 02, urea was side dressed to supply 170 lb N/acre.

The field was side-dressed with Temik® (15 percent aldicarb) at 10 lb/acre on June 2 and irrigated on June 3 to control sugar beet root maggot. On June 24, the trial was broadcast sprayed with Roundup Original Max at 22 oz/acre. The spray solution contained 5 percent AMS as well as a non-ionic surfactant applied at a spray rate of 30 gal of water/acre. This application was made using 110° 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 the first application because they had been protected from the overhead spray by the sugar beet canopy.

Petiole tests were taken on July 3 and 16. Based on petiole analyses, the plant nutrients B at 0.1 lb/acre and foliar S at 1.5 lb/acre were added to the fungicide application on July 18 to control powdery mildew. Headline® fungicide (23.6 percent pyraclostrobin) at 12 oz/acre with 4 lb S/acre was applied on June 27 and August 12. Enable® fungicide (23.5 percent fenbuconazole) was applied at 8 oz/acre with 4 lb S/acre on July 18.

Sugar beets were harvested on October 28 and 29. 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, weighed, and two eight-beet samples were taken from each plot. Samples were transported daily to the Snake River Sugar factory in Nampa, Idaho, 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.

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 two samples of beet quality data for each plot were averaged. The percent extraction was calculated using the formula:

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

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

Sugar sample data were checked for errors in sugar percentages and conductivity. Any erroneous sample readings were deleted from the data set. Observations more than two standard deviations from the mean for each variety were deleted.

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. Root yield for beet varieties in the Commercial Trial averaged 58.5 tared ton/acre and 16.9 percent sugar content (Table 1). The varieties among those with the highest root yield in the Commercial Trial included Crystal RR835 (64.9 ton/acre), Crystal RR968 and BTS 26RR14. Varieties among those with the highest recoverable sugar/acre were Crystal RR835 (18,500lb/acre), Crystal RR968, BTS 27RR20, and BTS 26RR14.

Root yield in the Experimental Trial averaged 59.0 tared ton/acre and 16.9 percent sugar content (Table 2). The varieties among those with the highest root yield included HM 9165RR (66.3 ton/acre), Crystal RR922, and HM PM9126RR. Varieties among those with the highest recoverable sugar per acre were HH SV36901RR (18,400lb/acre), HM 9165RR, SX 1583RR, Crystal RR922, and Crystal RR892.

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, 2009.

Variety	Root yield ton/acre	Sugar content %	Gross sugar lb/acre	Conduc- tivity mmhos	Extrac- tion %	Estimated recoverable sugar		
						lb/ton	lb/acre	
Crystal RR835	64.84	16.61	21541	0.668	85.99	285.6	18525	a
Crystal RR968	63.19	16.27	20563	0.721	85.22	277.3	17526	b
BTS 27RR20	58.46	17.43	20380	0.684	85.94	299.7	17516	b
BTS 26RR14	62.72	16.32	20463	0.703	85.47	279.0	17489	b
BTS 28RR04	60.02	16.97	20380	0.694	85.73	291.1	17473	bc
HM 9036RR	61.62	16.18	19954	0.675	85.80	277.6	17123	bcd
HH SV36602RR	57.31	17.27	19796	0.687	85.87	296.7	17000	bcd
BTS 27RR10	59.86	16.72	20023	0.756	84.86	283.8	16992	bcd
Crystal RR919	56.26	17.36	19535	0.618	86.78	301.3	16954	b-e
SX 1571RR	57.88	17.10	19792	0.703	85.63	292.8	16950	b-e
HM 9008RR	57.27	17.16	19639	0.673	86.03	295.3	16894	b-e
HM 9047RR	57.33	17.06	19574	0.655	86.24	294.3	16878	b-e
HH SV36603RR	59.47	16.63	19770	0.715	85.38	283.9	16877	b-e
Crystal RR966	61.60	16.05	19779	0.709	85.32	273.9	16876	b-e
Crystal RR989	59.70	16.68	19903	0.783	84.50	281.9	16816	b-e
BTS 28RR4N	56.37	17.19	19370	0.664	86.15	296.1	16687	cde
HH SV36601RR	56.46	17.02	19222	0.639	86.45	294.3	16618	de
Crystal RR929	54.90	17.45	19159	0.648	86.41	301.6	16555	de
BTS 28RR24	53.55	17.80	19054	0.659	86.33	307.3	16450	de
HM 9023RR	55.78	17.21	19192	0.709	85.57	294.6	16421	de
Crystal RR876	57.69	16.49	19038	0.742	84.99	280.2	16180	e
Crystal 9930RR	55.23	16.18	17881	0.703	85.44	276.5	15274	f
Average	58.49	16.87	19716	0.692	85.73	289.3	16902	
LSD (0.05)	2.24	0.48	905	0.035	0.49	9.0	793	

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, 2009.

Variety	Root yield ton/acre	Sugar content %	Gross sugar lb/acre	Conduc- tivity mmhos	Extrac- tion %	Estimated		
						recoverable sugar lb/ton	lb/acre	
HH SV36901RR	62.39	17.15	21399	0.665	86.13	295.4	18433	a ^z
HM 9165RR	66.25	15.99	21177	0.676	85.74	274.2	18157	ab
SX 1583RR	62.04	16.96	21016	0.670	86.03	291.8	18076	abc
Crystal RR922	64.78	16.27	21077	0.689	85.65	278.7	18051	abc
Crystal RR892	61.06	17.21	21023	0.689	85.83	295.5	18043	abc
Crystal RR933	62.44	16.70	20849	0.666	86.02	287.3	17937	a-d
BTS 27RR20 ^a	59.55	17.42	20738	0.658	86.27	300.6	17890	a-d
Crystal RR880	59.03	17.42	20565	0.609	86.91	302.8	17874	a-e
HM PM9122RR	62.20	16.57	20627	0.688	85.73	284.1	17687	a-f
HM PM9126RR	63.45	16.30	20690	0.730	85.11	277.6	17611	a-g
HH SV36801RR	59.40	17.10	20288	0.615	86.77	296.8	17603	a-g
HH SV36905RR	62.40	16.49	20586	0.723	85.24	281.2	17552	a-g
SX 1591RR	60.75	16.89	20515	0.714	85.45	288.7	17528	a-h
HM 9008RR ^a	59.89	17.05	20410	0.686	85.84	292.6	17520	a-h
BTS 29RR3N	60.33	16.97	20471	0.721	85.37	289.7	17477	b-i
HH SV36902RR	57.94	17.41	20180	0.653	86.34	300.6	17422	b-i
BTS 29RR49	58.31	17.39	20278	0.686	85.91	298.7	17421	b-i
Crystal RR968 ^a	63.16	16.18	20429	0.720	85.22	275.7	17407	b-i
BTS 29RR59	59.25	17.19	20378	0.729	85.30	293.3	17382	b-i
BTS 29RR19	58.08	17.42	20241	0.733	85.29	297.2	17265	b-i
HM PM9170RR	62.45	16.30	20353	0.787	84.36	275.1	17173	c-i
HM RP9172RR	60.33	16.55	19961	0.665	86.01	284.7	17169	c-i
HM 9167RR	55.89	17.51	19576	0.574	87.37	306.1	17104	d-j
HM RT9163RR	58.34	16.97	19803	0.664	86.11	292.3	17053	d-k
BTS 29RR69	56.93	17.26	19639	0.649	86.36	298.1	16958	e-l
HM RP9120RR	58.41	16.92	19772	0.693	85.73	290.1	16954	e-l
HH SV36803RR	61.15	16.26	19856	0.709	85.37	277.7	16954	e-l
HM 9164RR	59.05	16.64	19649	0.694	85.65	285.1	16829	f-l
HM RT9162RR	56.85	17.14	19499	0.698	85.70	293.8	16710	g-m
HM 9124RR	54.82	17.45	19128	0.579	87.30	304.7	16701	g-m
HH SV36601RR ^a	57.10	16.83	19227	0.642	86.37	290.6	16606	h-m
HM NT9166RR	57.40	16.89	19383	0.709	85.51	288.8	16572	i-m
BTS 29RR29	56.10	16.92	18984	0.715	85.44	289.2	16222	j-n
HH SV36904RR	53.51	17.47	18695	0.629	86.65	302.9	16205	j-o
BTS 29RR73	54.79	16.99	18634	0.629	86.57	294.2	16130	k-o
BTS 36RR11	56.54	16.76	18929	0.738	85.11	285.3	16108	l-o
Crystal RR944	53.97	17.15	18506	0.716	85.47	293.1	15818	mno
HM 9169RR	52.00	17.38	18086	0.695	85.79	298.2	15516	no
HM RT9168RR	52.07	16.98	17686	0.643	86.38	293.4	15280	o
Average	58.98	16.94	19959	0.680	85.89	291.0	17141	
LSD (0.05)	2.93	0.39	1062	0.034	0.47	7.5	929	

^a Commercial varieties used as check varieties.