

# EVALUATION OF SUGAR BEET VARIETIES IN CENTRAL OREGON, 1998

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## Abstract

Evaluation of sugar beet varieties (*Beta vulgaris*) in central Oregon was conducted in commercial fields near Culver and Prineville. Subsamples of seed for the thirty varieties were sent to the Beet Sugar Development Foundation to be evaluated for curly top resistance. The 3-row by 22 ft plots were rated for stand establishment prior to plants being hand-thinned to 7 in. apart. A single row per plot was harvested at both locations September 30, and samples evaluated by Spreckles Sugar for weight, percent sugar, and ppm Brie nitrate. The 1998 performance and 3-yr average performances are provided.

## Introduction

The seed evaluation committee of the Central Oregon Beet Growers Association determines what varieties may be grown in central Oregon based on yield, sugar, and resistance to beet curly top virus. The objective of this ongoing project is to evaluate performance of sugar beet varieties in both the Prineville and Culver areas.

## Methods and Materials

Thirty varieties submitted by five sugar beet seed companies were planted in commercial fields near Prineville on April 30 and near Culver on April 17 with replanting on May 8. An Earthway push planter was used for the 3-row x 22 ft plots, replicated four times in a randomized complete block design. Subsamples of seed from each variety were sent to the Beet Sugar Development Foundation at Kimberly, Idaho, to be evaluated for curly top resistance.

Four rhizomania resistant varieties were included in the evaluations at the request of the Central Oregon Beet Growers Association. The concern of the association was that the disease may have been brought into central Oregon on carrot stecklings or equipment from outside the area.

Plots were evaluated for stand establishment using a rating scale of 1 (poor) to 5 (excellent) on June 3 at Prineville and on June 11 at Culver. Both trials were hand-thinned to 7 in. between plants, with several subsequent passes through the fields to remove any remaining doubles, late germinating seed, and weeds. Varieties at both locations were evaluated September 29 for severity of powdery mildew using a rating scale of 0 (no powdery mildew) to 5 (total leaf coverage). The middle row of the three-row plots was harvested September 30 at both locations. Spreckles Sugar evaluated samples for weight, percent sugar, and ppm Brie nitrate. To determine change in percent sugar following the initial harvest, varieties approved for 1998 were resampled at both locations on October 8 and at the Culver location again on October 14 and 21.

## Results and Discussion

Performance of sugar beet varieties at the Prineville location is provided in Table 1. Variety performance at the Culver location is shown in Table 2, and Table 3 provides the average performance across both locations. Varieties are listed in descending order based on total sugar.

Although some varieties were rated low on stand establishment, after thinning to 7 in. between plants, varieties generally had equal, full stands. As a result, germination ratings are not expected to influence yield.

Powdery mildew was more prevalent at Culver than in Prineville, with some statistically significant differences at Culver. However, ratings ranging from 1.8 to 3.3 in Prineville and 2.7 to 4.5 in Culver provide some trends for powdery mildew tolerance between varieties at both locations.

Average percent sugar increased between September 30 to October 8 by 0.6 percent at Culver and 0.8 percent at Prineville. Sugar increased in subsequent samples in Culver by 0.9 percent from October 8 to 14 and by 0.6 percent from October 14 to 21. The total percent sugar increase for the period from September 30 to October 21 was 2.3 percent, averaging approximately 0.1 percent per day.

Yield results for each of the four replications were evaluated for uniformity. There was good uniformity across the replications at Culver but random low yields across the replications at Prineville. As a result, the lowest yield for each variety was dropped at the Prineville location, with yield data based on the three remaining replications. Dropping the low-yielding plots at Prineville and the need to replant at Culver probably contributed to the lower yields reported for Culver.

A 3-yr average of variety performance is provided in Table 4. This information provides the basis for establishing approved varieties by the Seed Committee of the Central Oregon Sugar Beet Growers Association. The standards established by the committee include the following: 1) acceptable varieties will have a 125 percent or less curly top resistance rating compared to the stand variety USH-11, based on a 3-yr trial average, 2) varieties with two years of trial data that rate 125 percent or below could have limited planting, not to collectively exceed 10 percent of total acreage of the previous year's crop, 3) no planting of any seed varieties without the approval of the seed committee, and 4) no sales of seed prior to December 15 for the upcoming season.

Variety performances in this report are best used to compare differences between variety performance under the same conditions, rather than making a direct comparison with other field harvest data. The average performance across the two locations should be helpful in determining performance across different locations and management practices. The 3-yr rolling averages provide an additional time dimension to the evaluations, which can increase confidence in the performance data.

A commercial-sized strip trial with six varieties was conducted at the same Prineville location as the variety evaluations. Those results are available as a separate research report.

Table 1. Performance of sugar beet varieties planted in a commercial field near Prineville, OR, April 30 and harvested September 30, 1998.

Variety	Stand rate	Powdery mildew	Yield	Sugar Sep 30	Sugar Oct 8	Total sugar	Brie nitrate	Curly top
	(1-5)	(0-5)	(ton/a)	(%)	(%)	(1b/a)	(13P111)	(% of USH-11)
Beta 8256 (Betaseed)	4.0 abc <sup>1</sup>	2.0	35.3 ab	17.7	18.0	12,493	34	121
Beta 5CG7010 (Betaseed)	2.0 de	2.8	36.7 a	16.6		12,209	58	139
Beta 6KG5925 (Betaseed)	3.5 abcd	2.3	33.9 abc	17.8		12,081	30	109
Oasis (Novartis)	4.5 ab	1.8	34.1 abc	16.8		11,478	31	100
H943226 (Spreckels)	3.0 bcde	2.8	34.6 ab	16.4		11,303	41	124
Beta 8757 (Betaseed)	4.5 ab	2.0	34.0 abc	16.6		11,272	52	112
Beta 8422 (Betaseed)	3.5 abcd	2.5	32.8 abc	17.1	17.4	11,232	41	100
Beta 8348 (Betaseed)	3.0 bcde	2.0	33.1 abc	16.8		11,090	52	136
SX 1404 (Seedex)	3.0 bcde	2.5	34.2 ab	16.2		11,089	31	88
HM2981 (Novartis) <sup>2</sup>	3.5 abcd	2.5	32.0 abc	16.7		10,626	35	100
Crystal 9800 (Crystal)	2.0 de	2.5	31.4 abc	16.9		10,626	36	109
98HX805 (Spreckels)	3.0 bcde	2.3	30.1 abc	17.6		10,586	28	148
Beta 4885 (Betaseed)	1.5 e	2.0	31.1 abc	17.0	17.4	10,581	33	139
96HX405 (Spreckels)	2.0 de	3.0	33.8 abc	15.6		10,572	44	100
PM21 (Novartis)	3.0 bcde	2.3	31.4 abc	16.5		10,371	32	97
Beta 8778 (Betaseed)	3.5 abcd	2.0	30.7 abc	16.9		10,376	39	145
Canyon (Novartis)	3.0 bcde	2.8	32.1 abc	16.2	17.1	10,369	37	94
Ranger (Seedex)	3.0 bcde	2.0	32.1 abc	16.2	16.8	10,353	31	112
97C203-04 (Spreckels) <sup>2</sup>	2.0 de	2.8	32.3 abc	16.0		10,349	67	127
98HX804 (Spreckels)	2.0 de	2.5	32.9 abc	15.5		10,220	42	106
Crystal 203 (Crystal)	4.0 abc	3.3	31.7 abc	16.1	17.4	10,168	55	130
Owyhee (Novartis)	4.0 abc	3.0	30.7 abc	16.9		10,150	42	91
Tomcat (Crystal)	5.0 a	2.8	30.2 abc	16.7		10,072	31	109
97C202-04 (Spreckels) <sup>2</sup>	3.0 bcde	2.8	31.7 abc	15.8		10,019	41	118
Chinook (Seedex)	3.5 abcd	2.8	30.5 abc	15.8	16.9	9,618	49	100
4035R (Betaseed) <sup>2</sup>	2.0 de	2.0	30.0 abc	15.6		9,349	73	118
H943222 (Spreckels)	3.0 bcde	2.0	30.0 abc	15.5		9,296	39	118
98HX816 (Spreckels)	2.5 cde	1.8	29.4 abc	15.7		9,230	44	97
Crystal 211 (Crystal)	3.5 abcd	3.3	26.3 c	17:2	17.5	9,024	27	115
97HX706 (Spreckels)	2.5 cde	2.8	28.4 be	17.4		9,897	26	127
		n. s.						
Average for 1998 approved varieties				16.7	17.3			

Variety results followed by the same letter(s) are not significantly different from one another <sup>2</sup> Rhizomania resistant variety funded by the Central Oregon Beet Growers

Table 2. Performance of sugar beet varieties planted in a commercial field near Culver, OR, May 8 and harvested September 30, 1998.

Variety	Stand rating	Powdery mildew	Yield	Sugar Sep 30	Sugar Oct 8	Sugar Oct 14	Sugar Oct 21	Total sugar	Brie nitrate	Curly top
	(1-5)	(0-5)	(ton/a)	(%)	(%)	(%)	(%)	(lb/a)	(ppm)	(% of USH-11)
Beta 5CG7010 (Betaseed)	2.0 ab	3.7 ab	33.9 ab	17.1				11,568	40	139
4035R (Betaseed) <sup>2</sup>	1.5 b	4.0 ab	34.5 a	16.8				11,510	34	118
Crystal 9800 (Crystal)	2.5 ab	3.5 ab	32.5 ab	16.9				10,984	27	109
97HX706 (Spreckels)	2.5 ab	3.0 ab	31.1 ab	17.6				10,938	26	127
Beta 8348 (Betaseed)	4.0 a	3.5 ab	31.9 ab	17.1				10,934	41	136
Owyhee (Novartis)	3.0 ab	3.7 ab	31.7 ab	17.2				10,900	27	91
H943226 (Spreckels)	3.0 ab	3.7 ab	32.6 ab	16.6				10,819	38	124
Ranger (Seedex)	1.5 b	3.2 ab	31.5 ab	17.1	17.7	18.8	19.5	10,792	36	112
HM2981 (Novartis) <sup>2</sup>	3.0 ab	2.7 b	31.9 ab	16.7				10,677	33	100
Beta 8422 (Betaseed)	1.5 b	4.0 ab	30.3 ab	17.5	18.1	19.5	20.1	10,591	33	100
98HX805 (Spreckels)	2.5 ab	3.0 ab	29.6 ab	17.5				10,351	32	148
Beta 8256 (Betaseed)	4.0 a	4.2 ab	28.6 ab	18.0	18.9	19.6	20.2	10,303	34	121
Oasis (Novartis)	2.0 ab	3.0 ab	29.4 ab	17.4				10,228	27	100
Canyon (Novartis)	2.5 ab	3.7 ab	29.1 ab	17.4	17.5	18.9	19.3	10,106	35	94
SX 1404 (Seedex)	3.5 ab	3.2 ab	28.6 ab	17.6				10,047	31	88
H943222 (Spreckels)	2.5 ab	3.7 ab	29.5 ab	16.9				9,988	29	118
96HX405 (Spreckels)	2.0 ab	4.2 ab	30.6 ab	15.8				9,792	37	100
Beta 6KG5925 (Betaseed)	3.5 ab	3.5 ab	26.9 ab	17.9				9,668	23	109
97C203-04 (Spreckels) <sup>2</sup>	2.0 ab	4.5 ab	29.6 ab	16.2				9,621	45	127
Crystal 211 (Crystal)	3.0 ab	4.0 ab	26.6 ab	18.0	19.1	19.6	20.2	9,589	26	115
Tomcat (Crystal)	2.5 ab	4.0 ab	27.1 ab	17.7				9,573	29	109
Chinook (Seedex)	3.0 ab	3.7 ab	28.0 ab	17.0	18.8	19.1	20.0	9,507	34	100
PM21 (Novartis)	1.5 b	3.7 ab	27.1 ab	17.5				9,478	24	97
Crystal 203 (Crystal)	3.0 ab	4.7 a	27.1 ab	17.4	18.6	19.7	19.8	9,446	25	130
Beta 8778 (Betaseed)	3.5 ab	4.0 ab	26.4 ab	17.7				9,357	29	145
Beta 8757 (Betaseed)	2.0 ab	4.0 ab	26.6 ab	17.5				9,314	30	112
98HX804 (Spreckels)	2.5 ab	4.0 ab	27.6 ab	16.8				9,307	28	106
98HX816 (Spreckels)	1.5 b	3.5 ab	28.0 ab	16.7				9,287	31	97
Beta 4885 (Betaseed)	3.5 ab	2.7 b	26.4 ab	17.8	18.6	19.2	20.0	9,251	38	139
97C202-04 (Spreckels) <sup>2</sup>	3.0 ab	3.5 ab	24.9 b	16.6				8,265	31	118
				n.s.						
Average for 1998 approved varieties				17.6 a	18.4 b	19.3 c	19.9 c			

<sup>1</sup> Variety results followed by the same letter(s) are not significantly different from one another <sup>2</sup> Rhyzomania resistant variety funded by the Central Oregon Beet Growers

Table 3. Average performance of sugar beet varieties across the Prineville and Culver locations in central Oregon during 1998.

Variety	Stand rating	Powdery mildew	Yield	Sugar 30-Sep	Sugar 8-Oct	Sugar 14-Oct	Sugar 21-Oct	Total sugar	Brie nitrate	Curly top
	(1-5)	(0-5)	(ton/a)	(%)	(%)	(%)	(%)	(lb/a)	(ppm)	(% of USH-11)
Beta 5CG7010 (Betaseed)	2.0	3.2	35.3	16.9				11,889	49	139
Beta 8256 (Betaseed)	4.0	3.1	31.9	17.9	18.5	19.6	20.2	11,398	34	121
H943226 (Spreckels)	3.0	3.2	33.6	16.5				11,061	39	124
Beta 8348 (Betaseed)	3.5	2.8	32.5	17.0				11,012	46	136
Beta 8422 (Betaseed)	2.5	3.3	31.6	17.3	17.8	19.5	20.1	10,916	37	100
Beta 6KG5925 (Betaseed)	3.5	2.9	30.4	17.9				10,875	26	109
Oasis (Novartis)	3.3	2.4	31.7	17.1				10,853	29	100
Crystal 9800 (Crystal)	2.3	3.0	31.9	16.9				10,805	32	109
HM2981 (Novartis) <sup>1</sup>	3.3	2.6	32.0	16.7				10,652	34	100
Ranger (Seedex)	2.3	2.6	31.8	16.7	17.3	18.8	19.5	10,573	33	112
SX 1404 (Seedex)	3.3	2.9	31.4	16.9				10,568	31	88
Owyhee (Novartis)	3.5	3.4	31.2	17.1				10,525	35	91
98HX805 (Spreckels)	2.8	2.6	29.9	17.6				10,469	30	148
4035R (Betaseed) <sup>1</sup>	1.8	3.0	32.3	16.2				10,430	54	118
97HX706 (Spreckels)	2.5	2.9	29.8	17.5				10,418	26	127
Beta 8757 (Betaseed)	3.3	3.0	30.3	17.1				10,293	41	112
Canyon (Novartis)	2.8	3.2	30.6	16.8	17.3	18.9	19.3	10,238	36	94
96HX405 (Spreckels)	2.0	3.6	32.2	15.7				10,182	40	100
97C203-04 (Spreckels) <sup>1</sup>	2.0	3.6	31.0	16.1				9,985	56	127
PM21 (Novartis)	2.3	3.0	29.3	17.0				9,925	28	97
Beta 4885 (Betaseed)	2.5	2.4	28.8	17.4	18.0	19.2	20.0	9,916	36	139
Beta 8778 (Betaseed)	3.5	3.0	28.6	17.3				9,867	34	145
Tomcat (Crystal)	3.8	3.4	28.7	17.2				9,823	30	109
Crystal 203 (Crystal)	3.5	4.0	29.4	16.8	18.0	19.7	19.8	9,807	40	130
98HX804 (Spreckels)	2.3	3.3	30.3	16.2				9,764	35	106
H943222 (Spreckels)	2.8	2.9	29.7	16.2				9,642	34	118
Chinook (Seedex)	3.3	3.2	29.3	16.4	17.9	19.1	20.0	9,563	41	100
Crystal 211 (Crystal)	3.3	3.6	26.5	17.6	18.3	19.6	20.2	9,307	26	115
98HX816 (Spreckels)	2.0	2.6	28.7	16.2				9,259	38	97
97C202-04 (Spreckels) <sup>1</sup>	3.0	3.1	28.3	16.2				9,142	36	118

<sup>1</sup>Rhizomania resistant variety funded by the Central Oregon Beet Growers Association

Table 4. Three-year rolling average and yearly performance for the 1999 approved varieties of sugar beets planted in central Oregon from 1996 to 1998.

Variety	Seed Company	Year	Yield (ton/a)	Sugar (%)	Total sugar (lb/a)	Curly top resistance (% of USH-11)
Beta 8220	Betaseed	<b>Aver.</b>	<b>36.7</b>	<b>17.1</b>	<b>12,530</b>	<b>123</b>
		1998	35.3	16.9	11,889	139
		1997	40.1	17.1	13,713	128
		1996	34.7	17.3	11,989	104
Beta 8757	Betaseed	<b>Aver.</b>	<b>33.7</b>	<b>17.3</b>	<b>11,621</b>	<b>115</b>
		1998	30.3	17.1	10,293	112
		1997	37.0	17.1	12,724	110
		1996	33.7	17.6	11,848	124
Beta 8422	Betaseed	<b>Aver.</b>	<b>32.4</b>	<b>17.5</b>	<b>11,349</b>	<b>105</b>
		1998	31.6	17.3	10,916	100
		1997	33.9	17.6	11,916	110
		1996	31.7	17.7	11,215	107
Ranger	Seedex	<b>Aver.</b>	<b>33.0</b>	<b>17.2</b>	<b>11,345</b>	<b>111</b>
		1998	31.8	16.7	10,573	112
		1997	34.1	17.6	11,987	108
		1996	33.2	17.3	11,477	113
Canyon	Novartis	<b>Aver.</b>	<b>32.5</b>	<b>17.0</b>	<b>11,071</b>	<b>93</b>
		1998	30.6	16.8	10,238	94
		1997	34.1	17.3	11,868	88
		1996	32.7	17.0	11,108	96
Crystal 203	Crystal Beet Seed	<b>Aver.</b>	<b>32.0</b>	<b>17.0</b>	<b>11,055</b>	<b>119</b>
		1998	29.4	16.8	9,807	130
		1997	34.2	17.4	11,948	98
		1996	33.2	17.2	11,410	130
Chinook	Seedex	<b>Aver.</b>	<b>32.6</b>	<b>16.9</b>	<b>11,036</b>	<b>105</b>
		1998	29.3	16.4	9,563	100
		1997	35.3	17.4	12,269	100
		1996	33.2	17.0	11,278	117
Crystal 211	Crystal Beet Seed	<b>Aver.</b>	<b>29.7</b>	<b>17.6</b>	<b>10,449</b>	<b>121</b>
		1998	26.5	17.6	9,307	115
		1997	31.4	17.9	11,249	123
		1996	31.2	17.3	10,792	126

Table 5. The two-year rolling averages and yearly performance for the limit sale varieties of suage beets grown in central Oregon, 1997 and 1998.

Variety	Seed Company	Year	Yield (tons/a)	Sugar (%)	Total sugar (lb/a)	Curly top resistance (% of USH-11)
96HX405	Spreckels	<b>Aver.</b>	<b>33.8</b>	<b>16.9</b>	<b>11,537</b>	<b>105</b>
		1998	32.2	15.7	10,182	100
		1997	35.4	18.1	12,892	110
Oasis	Novartis	<b>Aver.</b>	<b>32.7</b>	<b>17.4</b>	<b>11,428</b>	<b>100</b>
		1998	31.7	17.1	10,853	100
		1997	33.8	17.7	12,003	100
Tomcat	Crystal Beet Seed	<b>Aver.</b>	<b>32.2</b>	<b>17.5</b>	<b>11,321</b>	<b>106</b>
		1998	28.7	17.2	9,823	109
		1997	35.7	17.9	12,819	103
PM21	Novartis	<b>Aver.</b>	<b>31.3</b>	<b>17.4</b>	<b>10,910</b>	<b>103</b>
		1998	29.3	17.0	9,925	97
		1997	33.4	17.8	11,894	108
SX1404	Seedex	<b>Aver.</b>	<b>31.6</b>	<b>16.9</b>	<b>10,662</b>	<b>98</b>
		1998	31.4	16.9	10,568	88
		1997	31.8	16.9	10,756	108