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Grape Cultivar by Management System Trial Performance in 2008

Abstract
To identify grape cultivars adapted to Iowa, a cultivar by management system trial was established in 2002 at the Iowa State University (ISU) Horticulture Research Station (HRS) and the ISU Armstrong Research Farm (ARF) with a grant from the Leopold Center of Sustainable Agriculture. Fifteen cultivars, including 10 wine and five seedless table cultivars, are being evaluated under 1) a conventional management system that relies on herbicides for weed control and application of insecticides and fungicides on a regular basis; 2) an IPM/best management system that uses herbicides as needed and relies on monitoring to determine the need for insecticides and fungicides; and 3) an organicapproved system that relies on a straw mulch for weed control and use of organic-approved pest control strategies. In 2008, the management systems treatments were discontinued, but still influenced the results. This report summarizes the results for the 2008 growing season.

Keywords
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Grape Cultivar by Management System Trial Performance in 2008

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Introduction

To identify grape cultivars adapted to Iowa, a cultivar by management system trial was established in 2002 at the Iowa State University (ISU) Horticulture Research Station (HRS) and the ISU Armstrong Research Farm (ARF) with a grant from the Leopold Center of Sustainable Agriculture. Fifteen cultivars, including 10 wine and five seedless table cultivars, are being evaluated under 1) a conventional management system that relies on herbicides for weed control and application of insecticides and fungicides on a regular basis; 2) an IPM/best management system that uses herbicides as needed and relies on monitoring to determine the need for insecticides and fungicides; and 3) an organic-approved system that relies on a straw mulch for weed control and use of organic-approved pest control strategies. In 2008, the management systems treatments were discontinued, but still influenced the results. This report summarizes the results for the 2008 growing season.

Materials and Methods

The vines were spaced 8 × 10 ft apart (545 vines/acre) with three vines/replication. Treatments were replicated five times at HRS and three times at ARF. Vines were trained to a bilateral cordon system on a two-wire trellis with wires at 3.5 ft and 6.0 ft above the ground. Vines with a procumbent growth habit were being trained to the top wire, while those with a semi-upright to upright growth habit were trained to the mid-level wire with vertical shoot positioning (VSP) being practiced.

In mid-March, five proximal (basal) buds on three canes/replication (15 buds) were dissected and examined for injury to determine if adjustments in pruning were needed. Vines were pruned and the 1-year-old trimmings were weighed. Bud retention was based on pruning weight, and adjusted for primary bud mortality when injury exceeded 15% for American cultivars and 20% for French-American hybrid cultivars. The length of established 2-year-old cordon was measured. Following bud break, shoots originating from primary buds were counted, and excess basal shoots and double shoots were removed. Following veraison, berry samples were collected from the mid-cluster position to test for maturity based on percentage soluble solids (%SS), initial pH, and titratable acids (TA). Time of harvest was based upon these measurements and fruit condition. At harvest, the number of clusters/vine were counted and weighed.

Results and Discussion

During the 2007–2008 winter, vines were exposed to three significant freezes at ARF and HRS (Table 1). When cane buds were examined for injury prior to pruning, greater injury was found at HRS, which recorded lower temperatures than at ARF (Table 2). The injury was generally greatest on cultivars classified as being “slightly hardy” to “moderately hardy,” while those classified as being “very hardy” exhibited the least injury.

Based upon pruning weights, vines generally grew better at ARF than at HRS in 2007 (Table 2). Cultivars that are very vigorous at

both sites include La Crosse, St Croix, Mars, and Edelweiss. Generally, most cultivars that are classified as being "slightly hardy" to "moderately hardy" had higher pruning weights at ARF than at HRS, while those classified as being "hardy" to "very hardy" had similar pruning weights. These differences are reflected by the amount of cordon establishment among cultivars and are a reflection of cultivar adaptation (Table 2). This was most evident for Chambourcin, Vignole, Vanessa, Marquis, and Jupiter. Between management systems, vines in the organic-approved system had lowest pruning weights and established cordon lengths at both sites. The number of primary shoots per foot of cordon, for which the optimum range is 4 to 6, generally reflected the extent of primary bud injury recorded at the sites and the hardiness classification of the cultivars (Table 2).

Vines at each site were exposed to growth regulator herbicide drift during the growing season but symptoms of injury were not as severe as in previous years (data not shown). Differences in injury among cultivars and time of occurrence were similar to 2,4-D drift rather than for dicamba.

The 2008 growing season was characterized by a late spring; excessive rainfall in May, June, and July; and cooler than normal growing conditions. Bud break at HRS averaged 12 days later than in 2007 (Table 2). Accumulated growing degree days from May 1 to October 1 were below normal with ARF having the least departure from the average (Table 1). Compared with previous years, harvest was delayed at both sites with HRS experiencing the greatest delay (Table 3). In addition to the late spring and cool growing season, heavy crops at HRS on Maréchal Foch, Frontenac, St. Croix, and La Crosse may have contributed to the delayed harvest (Table 3). With the exception of Chambourcin, Traminette, Jupiter, and Vanessa, which have not adapted well at HRS, the highest yields were recorded at HRS (Table 3). The ARF planting was hit by damaging winds in excess of 60 mph on May 25, June 27, and with hail on July 8 that reduced the crop. At both sites, the lowest yields occurred in the organic-approved management system. This was a reflection of vine establishment and not practices performed during the growing season.

The desired initial pH for making white table wines is from 3.2 to 3.4 and 3.3 to 3.5 for red table wines. In previous years, a high initial pH has been a problem and the primary criteria used for determining when to harvest. In 2008, at ARF which had a closer to normal growing season based on growing degree days and lighter crop loads, initial pH was the primary criteria for harvesting most of the early season wine cultivars (Table 3). At HRS, which experienced a cooler growing season and had heavy crop loads, even with extended delays of harvest, most cultivars did not approach the desired initial pH range for white or red table wines.

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Table 1. Major minimum temperatures (°F) recorded during the 2007–08 winter and accumulated growing degree days from May 1 to October 1, 2008.

Date	ARF	HRS
Minimum temperatures (°F):		
Jan 19	-11	-10
Jan 24	-12	-17
Feb 13	1	-9
Feb 20	-10	-4
Growing degree days (base 50°F, cap 86°F)		
May 1 to Oct 1[z]	2,801	2,675
Departure from avg.	-54	-156
Days above 86°F	14	9

[z]From the ISU Ag Climate Network.

Table 2. Primary bud survival, pruning weight, feet of established cordon, primary shoot density and date of bud break in 2008 for 15 grape cultivars in the ISU 2002 grape cultivar by management system trial planted at the Armstrong Research Farm (ARF) and Horticulture Research Station (HRS).

		% Primary bud injury		Pruning wt (lb)		Ft of Cordon per vine		Primary shoots/ ft		Date of bud break[y]	
Treatment	Relative hardiness[z]	ARF	HRS	ARF	HRS	ARF	HRS	ARF	HRS	ARF	HRS
Management system											
Conventional		33	41	3.5	2.3	7.6	6.2	5.7	3.0	131	130
IPM/best mgmt		32	42	3.4	2.5	7.5	6.0	5.4	3.2	131	130
Organic-approved		25	44	2.8	1.8	7.0	5.3	5.4	2.8	130	130
LSD, P < .05		ns	ns	.2	.3	.3	.3	ns	.3	ns	ns
Cultivar											
Chambourcin[x]	3	79	91	4.4	1.8	6.6	2.1	1.2	.4	138	137
Seyval Blanc[x]	4	54	75	3.2	1.8	7.7	6.6	6.3	2.1	130	129
Vignole[x]	4	26	55	4.7	1.9	8.0	6.7	4.5	2.7	135	132
Traminette[x]	4	25	44	4.4	1.6	7.8	2.9	4.3	2.4	134	133
Cynthiana	4	18	44	3.1	1.7	7.7	7.1	6.5	2.3	134	133
Maréchal Foch	5	5	14	1.6	1.5	7.2	6.5	7.5	3.8	127	126
Edelweiss	5	15	22	3.5	2.8	7.0	7.1	4.7	4.1	128	127
La Crosse[x]	5	12	16	4.2	3.1	8.0	7.8	7.8	5.6	128	128
St. Croix	6	13	25	3.9	3.1	7.9	7.8	7.3	4.9	128	128
Frontenac	6	5	4	2.4	3.0	8.0	7.8	8.1	7.1	128	127
Vanessa	4	40	93	2.6	1.8	6.2	3.2	4.3	.8	130	132
Marquis	4	51	84	1.7	1.8	6.3	4.6	3.9	.8	131	132
Jupiter[w]	4	44	75	3.1	1.8	7.9	2.5	5.7	1.2	130	130
Reliance	4	38	57	2.1	2.1	6.9	7.2	3.5	2.2	132	128
Mars	4	28	54	4.1	3.2	7.9	7.3	6.4	2.9	129	128
LSD, P < .05		14	11	.5	.4	.9	1.1	.9	.5	1	1

[z]Relative cold hardiness (temperature range at which injury begins to occur): 3 = cold tender/slightly hardy (-5°F); 4 = moderately hardy (-10°F); 5 = hardy (-15°F); 6 = very hardy (-20°F).
[y]Julian date; 126 = May 5, 2008
[x]Trained to VSP.
[w]Planted in 2003.

Table 3. Fruit yield and harvest characteristics in 2008 for 15 grape cultivars in the ISU 2002 grape cultivar by management system trial planted at the Armstrong Research Farm and Horticulture Research Station.

	ISU Armstrong Research Farm						ISU Horticulture Research Station					
Treatment	Harvest Date	% SS	pH [y]	TA [z]	Yield (lb)	Cluster wt (lb)	Harvest Date	% SS	pH	TA [z]	Yield (lb)	Cluster wt (lb)
Management System												
Conventional					8.7	.19					16.0	.40
IPM/best mgmt					7.7	.19					15.9	.38
Organic-approved					6.0	.18					12.9	.37
LSD, P < .05					2.4	ns					1.9	ns
Cultivar												
Maréchal Foch	8/28	20.8	3.58	11.3	8.8	.11	9/4	19.4	3.04	11.1	20.6	.23
Frontenac	9/1	20.2	3.43	15.3	8.5	.15	10/1 [w]	22.5	3.28	15.6	27.9	.25
Cynthiana	10/10	22.3	3.31	13.8	4.0	.09	10/20 [v]	22.6	3.12	14.8	11.2	.15
St. Croix	9/1	17.1	3.68	10.7	8.4	.16	9/11 [w]	17.6	3.20	9.4	25.9	.26
Chambourcin	9/30	19.4	3.38	13.4	5.0	.25	10/20 [v]	22.4	3.00	11.9	2.9	.48
Seyval Blanc	8/29	18.6	3.49	8.3	13.1	.28	9/9 [v]	20.4	2.97	9.8	14.5	.57
La Crosse	8/29	15.2	3.57	13.1	10.4	.15	9/25 [w]	17.8	2.94	8.8	32.7	.29
Vignole	9/5	19.8	3.34	10.8	4.6	.10	10/2	22.0	2.99	13.8	12.0	.19
Traminette	9/10	15.9	3.24	11.9	12.8	.23	10/14	20.8	2.88	8.1	4.7	.21
Edelweiss	8/25	15.0	3.28	14.6	3.3	.20	9/3 [w]	15.1	3.11	9.4	21.1	.38
Marquis	9/2	17.0	3.61	6.5	5.8	.26	9/22 [v]	17.0	.	.	9.9	.78
Vanessa	8/24	18.9	3.38	8.3	3.2	.15	8/22	18.0	.	.	2.9	.32
Reliance	8/25	18.9	3.31	11.9	4.0	.24	8/22	20.0	.	.	9.0	.64
Mars	9/2	17.5	3.53	8.4	9.0	.23	9/5	17.0	.	.	18.2	.47
Jupiter [x]	9/28	17.9	3.52	7.2	11.6	.24	8/22	17.0	.	.	8.3	.54
LSD, P < .05					2.2	.03					3.7	.06

[z] Titratable acids reported in grams/liter.

[y] Missing data for the wine cultivars occurred when the auto temperature compensator on the pH meter malfunctioned.

[x] Planted in 2003.

[w] Cultivar was included in crop load study conducted by Randle Vos; values represent overall means.

[v] Maturity tests were performed seven or more days before harvest.