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Wine Grape Cultivar Trial Performance in 2009

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Abstract
To assess the regional adaptation of wine grape cultivars in Iowa, a trial was established in 2003 through an Iowa Department of Agriculture and Land Stewardship (IDALS) specialty crops grant awarded to the Iowa Wine Growers Association (IWGA). The trial was designed to evaluate up to 20 cultivars or advanced selections at four Iowa State University (ISU) farms representing different geographic, climatic, and soil conditions: Horticulture Research Station (HRS), Ames; the Armstrong Research Farm (ARF), Lewis; the Southeast Research Farm (SERF), Crawfordsville; and the Northeast Research Farm (NERF), Nashua. The SERF and NERF plantings also included the 15 cultivars being evaluated in the 2002 grape cultivar by management system trial. This report summarizes the results for the 2009 growing season.

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Introduction

To assess the regional adaptation of wine grape cultivars in Iowa, a trial was established in 2003 through an Iowa Department of Agriculture and Land Stewardship (IDALS) specialty crops grant awarded to the Iowa Wine Growers Association (IWGA). The trial was designed to evaluate up to 20 cultivars or advanced selections at four Iowa State University (ISU) farms representing different geographic, climatic, and soil conditions: Horticulture Research Station (HRS), Ames; the Armstrong Research Farm (ARF), Lewis; the Southeast Research Farm (SERF), Crawfordsville; and the Northeast Research Farm (NERF), Nashua. The SERF and NERF plantings also included the 15 cultivars being evaluated in the 2002 grape cultivar by management system trial. This report summarizes the results for the 2009 growing season.

Materials and Methods

The vines were spaced 8 × 10 ft apart (545 vines/A) with three vines/replication. Treatments were replicated four times at each site (12 vines/cultivar). 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 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) practiced.

A mid-January freeze severely affected grapevines at each of the planting sites (Table 1). In mid-March, five proximal (basal) buds on two canes per vine (30 buds per replication) were dissected and evaluated for primary bud injury. 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. Date of bud break was recorded at ARF and HRS. Following bud break, trunks killed to the ground were counted, and the length of established 2-year-old cordon was measured. During the growing season, vines at ARF, HRS, and NERF were exposed to growth regulator herbicide drift and were rated for the severity of injury. 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 per vine were counted and weighed.

Results and Discussion

During the 2008–09 winter, vines were exposed to four significant freezes with NERF followed by HRS recording the lowest temperatures (Table 1). When cane buds were examined for injury prior to pruning, greater injury was found at NERF and HRS than at ARF or SERF (Table 2). Although minimum temperatures recorded at ARF and SERF were similar, ARF experienced more freezing episodes at or below -10°F, and bud injury was greater there than at SERF. At all four sites, 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 bud injury. There was also a high incidence of

trunks killed to the ground at HRS, NERF, and SERF, particularly on the less hardy cultivars (Table 2). Crop load and late harvest in 2008 at HRS probably contributed to the high bud injury and trunks killed to the ground.

Based on pruning weights, vines generally grew better at ARF and HRS than at SERF and NERF in 2009 (Table 3). However, pruning weights were confounded by winter injury to the vines as reflected by trunk kill and feet of established cordon per vine. Among cultivars, Marquette continues to exhibit differences in vine vigor between sites.

Vines at ARF, HRS, and NERF were again exposed to growth regulator herbicide drift during the growing season (Table 3). At each of the sites, NY76.0844.24 exhibited the greatest injury. Vidal blanc, Cayuga White, De Chaunac, St. Vincent, Chancellor, GR-7, Brianna, and Frontenac Gris did not exhibit injury at any of the sites.

The 2009 growing season was characterized by cooler than normal growing conditions with the departure from normal for growing degree days being the greatest at SERF followed by NERF and HRS (Table 1). As a result, harvest was delayed compared with previous years with several late maturing cultivars harvested after the first killing frost and before they obtained proper maturity (Table 4 and 5). Vines at ARF were exposed to the warmest growing season, and cultivars generally matured much earlier than at the other sites. Yield/vine and average cluster weights were lower than in previous years, particularly on the less hardy cultivars that suffered the greatest bud injury and had a greater percentage of trunks killed to the ground. Generally, yields/vine were higher on cold hardy cultivars than on moderately hardy cultivars.

At HRS, berry set was very poor on Prairie Star and NY76.0844.24 vines. This was reflected by low cluster weights and occurred to some degree at ARF and SERF (Tables 4 and 5). For Prairie Star, poor berry set was caused by the failure of the caps to shed during bloom. For NY76.0844.24, exposure to growth regulator herbicide drift during the bloom period caused the immature berries to abort and rachises to become distorted.

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Table 1. Significant minimum temperatures (°F) recorded during the 2008–09 winter and 2009 fall, and accumulated growing degree days from May 1 to October 1, 2009.

Date	ARF	HRS	SERF	NERF
Minimum temperatures (°F):				
Dec. 22	-11	-14	-11	-17
Jan. 15/16	-20	-25	-29	-28
Jan. 24	-3	-9	-9	-14
Jan. 28	-6	-11	-10	-9
Oct. 10	25	24	25	25
Growing Degree Days (base 50°F, cap. 86°F):				
May 1 to Oct. 1[z]	2,605	2,498	2,526	2,307
Departure from avg.	-250	-333	-588	-368
Days above 86°F	11	8	8	5

[z]From the ISU Ag Climate Network.

Table 2. Primary bud injury recorded before pruning and percentage of trunks killed following exposure to freezes during the 2008–09 winter for 20 cultivars in the ISU 2003 wine grape cultivar trial planted at the ARF and HRS, and the 35 cultivars at the SERF, and NERF, and date of bud break at ARF and HRS.[y]

	Relative	% Primary bud injury				% of trunks killed			
Cultivar	hardiness [z]	ARF	HRS	SERF	NERF	ARF	HRS	SERF	NERF
Vidal blanc	4	79	63	85	100	8	59	16	22
Cayuga White	4	53	73	100	71	0	62	8	25
Landot 4511	4	57	69	93	96	0	8	0	37
Noiret	4	58	47	91	35	0	27	0	11
NY84.0101.04	4	48	50	89	40	17	89	25	50
Corot noir	4	46	57	98	56	0	61	4	25
De Chaunac	4	34	77	72	26	0	38	13	0
St. Vincent	4	51	63	83	33	24	32	0	15
Chancellor	5	30	70	60	22	0	4	13	0
Esprit	5	38	62	83	30	0	0	0	0
NY76.0844.24[x]	5	23	52	51	18	0	0	0	0
Léon Millot	5	31	37	39	14	0	0	0	0
GR-7	6	38	49	78	35	0	0	5	0
Brianna[x]	6	38	29	39	12	0	0	0	0
Swenson White[v]	6	34	30	66	21	0	0	0	0
MN-1198[x]	6	41	37	62	15	0	0	0	0
Marquette[x]	6	21	34	28	2	0	0	0	0
Prairie Star	6	15	13	25	9	0	0	9	0
La Crescent	6	18	28	54	5	0	0	0	0
Frontenac Gris[w]	6	32	9	.	.	0	0	0	0
Chambourcin	3			89	100			29	33
Traminette	4			89	100			6	100
Seyval Blanc	4			93	80			0	17
Vignole	4			74	43			0	6
Cynthiana	4			73	33			0	0
Maréchal Foch	5			48	9			0	0
Edelweiss	5			53	13			0	0
La Crosse	5			49	26			8	0
St. Croix	6			18	9			0	0
Frontenac	6			30	8			0	0
Marquis	4			100	93			17	67
Vanessa	4			98	68			27	11
Jupiter	4			98	77			0	50
Reliance	4			99	61			0	0
Mars	4			95	18			0	0
LSD, P < .05		16	19	17	20				

[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).

[x]Planted in 2004.

[w]Planted in 2004 at the Horticulture Research Station, and in 2006 at the other sites.

[v]Planted in 2005.

[y]ARF = Armstrong Research Farm, Lewis, IA; HRS = Horticulture Research Station, Ames, IA; SERF = Southeast Research Farm, Crawfordsville, IA; and NERF = Northeast Research Farm, Nashua, IA.

Table 3. Pruning weight and feet of established cordon following the 2008 growing season, 2009 bud date of bud break and herbicide drift rating for 20 cultivars in the ISU 2003 wine grape cultivar trial planted at the ARF and the HRS, and 35 cultivars at the SERF and the NERF.[u]

	Pruning weight (lb)				Feet of established cordon per vine				Bud break[z]		Herbicide drift injury[y]		
Cultivar	ARF	HRS	SERF	NERF	ARF	HRS	SERF	NERF	ARF	HRS	ARF	HRS	NERF
Vidal blanc	1.9	1.8	.9	.5	7.2	2.0	6.3	.6	137	132	1.0	1.0	1.0
Cayuga White	2.0	2.2	.8	.6	7.7	1.8	6.3	2.3	135	135	1.0	1.0	1.0
Landot 4511	2.3	2.4	.9	.6	8.0	5.9	6.9	2.2	135	135	1.2	1.0	1.0
Noiret	2.2	2.2	1.6	1.0	8.0	4.0	7.8	5.3	130	127	1.0	1.0	1.1
NY84.0101.04	1.5	2.0	.2	.4	5.8	.1	4.8	1.4	135	132	1.6	1.0	2.2
Corot noir	1.4	1.4	1.1	.8	8.0	1.7	6.2	3.3	134	130	1.1	1.1	1.0
De Chaunac	3.3	3.1	1.8	1.6	8.0	3.1	6.5	7.9	127	127	1.0	1.0	1.0
St. Vincent	2.8	3.7	1.3	1.0	5.3	4.9	7.5	4.7	132	130	1.0	1.0	1.0
Chancellor	2.3	1.3	.6	.6	8.0	6.0	6.0	5.6	129	125	1.0	1.0	1.0
Esprit	1.6	2.9	1.0	.7	8.0	8.0	7.0	6.8	128	125	2.4	2.0	1.5
NY76.0844.24[x]	1.1	2.0	.5	.3	5.1	6.8	4.8	1.4	127	125	5.0	5.0	4.6
Léon Millot	1.7	2.6	.8	.9	8.0	7.2	7.3	6.5	127	124	2.8	3.6	2.8
GR-7	2.0	2.9	1.7	1.7	8.0	7.5	6.4	7.2	125	122	1.0	1.0	1.0
Brianna[x]	1.9	3.1	1.1	1.1	8.0	7.8	6.0	7.0	125	124	1.0	1.0	1.0
Swenson White[v]	1.6	2.7	1.5	.9	8.0	7.2	4.7	3.6	129	125	3.3	3.4	2.1
MN-1198[x]	.8	1.6	.4	.4	8.0	7.1	5.8	5.5	121	121	1.1	1.5	1.0
Marquette[x]	1.6	4.1	1.5	.6	8.0	7.8	6.3	3.3	121	121	1.8	1.3	1.1
Prairie Star	3.2	4.2	1.7	1.7	8.0	7.7	6.3	7.9	127	124	2.6	3.0	1.7
La Crescent	2.1	3.4	1.8	3.3	8.0	8.0	7.3	7.9	121	122	2.3	2.1	1.0
Frontenac Gris[w]	.7	2.2	.6	.2	7.8	7.3	1.0	.0	125	123	1.0	1.0	1.0
Chambourcin			.9	.5			4.5	.3					1.0
Traminette			.8	.5			5.8	.0					1.0
Seyval Blanc			.5	1.0			6.5	5.1					1.0
Vignole			.9	.5			7.5	3.0					1.0
Cynthiana			.9	.4			5.5	2.1					3.0
Maréchal Foch			.5	.4			6.0	6.5					3.0
Edelweiss			1.7	1.6			6.8	6.3					1.5
La Crosse			.9	1.2			6.6	7.6					1.0
St. Croix			1.2	1.4			7.5	7.8					1.0
Frontenac			.9	.9			7.3	7.2					1.0
Marquis			.7	.3			3.8	.6					1.0
Vanessa			.9	.3			4.3	.6					2.5
Jupiter			1.1	.6			5.9	1.2					1.1
Reliance			1.0	1.0			7.0	6.4					1.2
Mars			2.4	1.9			7.5	7.5					1.0
LSD, P < .05	.5	.9	.4	.5	1.2	1.8	1.6	1.7	.9	1.5	.4	.3	.3

[z]Julian date; 126 = May 5, 2008

[y]Herbicide injury scale 1–6: 1 = no apparent injury; 2 = slight symptoms of abnormal venation; 3 = moderate; 4 = severe; 5 = very severe; 6 = extremely severe.

[x]Planted in 2004.

[w]Planted in 2004 at the Horticulture Research Station and in 2006 at the other sites.

[v]Planted in 2005.

[u]ARF = Armstrong Research Farm, Lewis, IA; HRS = Horticulture Research Station, Ames, IA; SERF = Southeast Research Farm, Crawfordsville, IA; and NERF = Northeast Research Farm, Nashua, IA.

Table 4. Fruit yield and harvest characteristics in 2009 for 20 cultivars in the ISU 2003 wine grape cultivar trial planted at the ARF and HRS.[u]

	Armstrong Research Farm						Horticulture Research Station					
Cultivar	Harvest date	% SS	pH[y]	TA[z]	Yield /vine (lb)	Cluster wt. (lb)	Harvest date	% SS	pH	TA[z]	Yield /vine (lb)	Cluster wt (lb)
Léon Millot	8/24	20.3	3.56	8.0	11.9	.17	8/29	18.1	3.63	7.6	11.7	.13
Prairie Star	8/24	15.2	3.34	10.7	13.6	.18	9/1	16.8	3.56	9.1	1.8	.07
Brianna[y]	8/24	17.3	3.31	9.0	15.4	.28	9/1[t]	.	.	.	24.6	.23
La Crescent	8/26	18.7	3.23	12.8	21.6	.28	9/15[t]	.	.	.	20.9	.23
MN-1198[y]	8/24[v]	20.0	3.01	13.5	10.7	.24	9/15	20.9	3.20	8.7	20.6	.23
Marquette[y]	9/4	23.9	3.38	9.0	11.9	.20	9/14[t]	.	.	.	17.5	.15
Swenson White[w]	9/8	18.1	3.31	6.6	17.7	.36	9/15	19.0	3.51	5.2	21.6	.36
Esprit	9/8	17.3	3.34	10.1	10.6	.33	9/20	17.8	3.33	10.6	13.7	.36
Landot 4511	9/8	16.2	3.21	8.0	9.6	.23	9/28	19.6	3.51	6.3	2.1	.12
Frontenac Gris[x]	9/8[v]	23.4	3.14	12.3	10.3	.17	9/22[t]	.	.	.	17.3	.20
NY84.0101.04	9/8	18.9	3.29	10.9	6.6	.37	.	.	.	.	.0	.
Chancellor	9/8	17.5	3.24	12.9	19.9	.22	10/12[v]	21.5	3.23	9.9	9.4	.13
De Chaunac	9/8	16.9	3.21	11.4	11.2	.15	10/12[v]	19.5	3.44	8.0	2.4	.10
GR-7	9/9	18.5	3.45	11.7	7.2	.18	10/7	21.2	3.69	7.3	12.5	.18
NY76.0844.24[y]	9/9	18.5	3.21	10.5	.8	.11	10/7	.	.	.	.4	.08
Cayuga White	9/10	19.2	3.26	8.2	7.5	.47	9/28	19.5	3.26	7.7	.9	.36
Corot noir	9/22	18.4	3.29	8.6	12.6	.34	10/12[v]	19.2	3.24	7.8	1.5	.17
Vidal blanc	9/22	18.8	3.24	9.9	6.6	.41	10/12[v]	20.4	3.15	8.6	1.2	.19
Noiret	9/29	18.6	3.35	8.7	6.4	.26	10/12[v]	18.9	3.41	9.5	1.7	.15
St. Vincent	10/13[v]	20.0	3.12	11.3	8.8	.33	10/12[v]	19.8	3.09	12.4	3.6	.22
LSD, P < .05					3.9	.05					2.5	.04

[z]Titratable acids reported in grams/liter.
[y]Planted in 2004.
[x]Planted in 2004 at the Horticulture Research Station and in 2006 at the other site.
[w]Planted in 2005.
[v]Harvested early or after the killing frost.
[t]Cultivar was included in a graduate student research project.
[u]ARF = Armstrong Research Farm, Lewis, IA; and HRS = Horticulture Research Station, Ames, IA.

Table 5. Fruit yield and harvest characteristics in 2008 for 35 cultivars in the ISU 2003 wine grape cultivar trial planted at the Southeast and Northeast Research Farms, Crawfordsville and Nashua, IA, respectively.

	Southeast Research Farm						Northeast Research Farm					
Cultivar	Harvest date	% SS	pH	TA[z]	Yield /vine (lb)	Cluster wt (lb)	Harvest date	% SS	pH	TA[z]	Yield /vine (lb)	Cluster wt. (lb)
Léon Millot	9/3[v]	19.3	3.54	8.3	8.3	.14	9/16	20.4	3.39	8.6	13.3	.17
Prairie Star	8/28	17.3	3.39	9.0	5.2	.11	9/10	17.8	3.52	9.0	11.9	.21
Brianna[y]	8/28	20.5	3.40	8.4	8.5	.17	9/9	18.7	3.36	9.3	18.0	.26
La Crescent	9/15	22.7	3.24	10.5	11.5	.25	9/17	19.9	3.23	12.6	19.6	.26
Marquette[y, v]	9/3[v]	23.3	3.36	10.4	9.8	.17	10/2	26.0	3.22	10.2	8.4	.16
MN-1198[y]	9/15	22.2	3.27	9.0	8.1	.24	9/15[w]	20.8	3.04	12.4	11.3	.24
Swenson White[x]	9/8[v]	19.2	3.22	10.7	17.7	.44	9/23	19.7	3.24	7.2	12.1	.39
Esprit	9/15	17.2	3.33	9.0	6.5	.36	9/29	17.9	3.40	7.2	16.2	.49
Landot 4511	9/8[v]	17.2	3.27	9.5	1.5	.12	9/23	19.2	3.33	7.6	1.9	.14
Frontenac Gris[w]	9/22	25.5	3.27	10.2	4.7	.20	10/2[w]	24.6	3.19	10.8	4.6	.17
NY84.0101.04	9/8[v]	19.4	3.19	11.0	3.6	.29	10/5	21.4	3.36	9.9	2.5	.26
Chancellor	9/22[v]	18.5	3.34	8.9	12.2	.23	10/5[w]	19.4	3.23	11.7	11.4	.23
De Chaunac	9/22[v]	17.9	3.32	8.9	4.4	.15	9/28[w]	20.0	3.26	11.9	19.3	.22
GR-7	9/29	21.2	3.35	8.6	4.5	.15	10/1	19.7	3.45	9.8	12.9	.21
NY76.0844.24[y]	9/29[w]	19.1	3.12	9.8	1.2	.10	10/5[w]	21.5	3.18	10.8	2.5	.15
Cayuga White	9/8[v]	17.8	3.20	11.0	1.4	.32	9/23	20.2	3.12	9.3	3.2	.37
Corot noir[v]	9/22	18.4	3.32	7.5	5.7	.26	10/2	16.2	3.22	9.3	9.5	.37
Vidal blanc	9/22	20.2	3.30	10.4	3.8	.25	10/5[w]	20.5	3.21	12.3	1.6	.71
Noiret[v]	9/29	17.0	3.20	8.9	1.7	.18	10/1[w]	18.0	3.07	10.7	6.3	.28
St. Vincent	10/13[w]	19.0	2.90	11.6	5.4	.33	10/13[w]	19.6	3.26	10.5	9.9	.48
Maréchal Foch	8/28	19.2	3.49	7.5	7.8	.15	9/17	19.6	3.32	9.0	14.0	.19
Seyval Blanc	8/25	17.7	3.57	10.2	10.1	.51	9/28	21.8	3.36	7.6	11.2	.49
Edelweiss	8/25	15.2	3.61	10.4	9.7	.38	9/10	16.6	3.30	10.8	10.8	.34
La Crosse	9/8[v]	18.0	3.23	11.0	9.2	.18	9/17[w]	17.9	3.03	11.9	17.5	.21
St. Croix	9/8[v]	18.0	3.36	11.0	7.8	.17	9/28	19.0	3.46	8.1	17.8	.26
Frontenac	9/29	24.2	3.30	11.3	10.4	.22	10/2[w]	22.8	3.23	12.8	10.7	.19
Vignole	9/29	22.6	3.20	11.0	2.9	.13	10/5[w]	17.8	3.08	12.2	3.5	.21
Traminette	9/29	20.5	3.15	7.4	2.8	.13	9/26	.	.	.	.0	.
Chambourcin	10/13[w]	21.0	3.01	10.7	1.0	.27	10/13[w]	21.0	3.24	10.7	.5	.40
Cynthiana	10/13[w]	21.0	2.91	18.2	3.7	.13	10/13[w]	20.2	3.01	20.7	4.0	.16
Vanessa	8/18	17.0 *min.*	.	.	.1	.15	9/9	18.9	3.05	8.2	.4	.14
Reliance	8/18	17.0 *min.*	.	.	3.4	.57	9/9	18.9	3.24	8.9	13.1	.49
Jupiter	8/18	17.0 *min.*	.	.	3.0	.37	9/3	17.1	3.25	9.3	6.8	.83
Mars	9/3	17.0 *min.*	.	.	7.0	.29	9/22	17.6	3.29	6.6	18.2	.45
Marquis	9.3	17.0 *min.*	.	.	1.7	.31	9/29	17.3	3.26	5.8	1.3	.51
LSD, P < .05					2.7	.06					3.9	.18

[z]Titratable acids reported in grams/liter.
[y]Planted in 2004.
[x]Planted in 2005.
[w]Planted in 2006.
[v]Maturity tests were performed five or more days before harvest.
[w]Harvested early or after the killing frost.