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Abstract

To assess the regional adaptation of wine grape cultivars to 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. The trial was designed to evaluate up to 20 cultivars or advanced selections at four 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 2006 growing season.

Keywords

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Introduction

To assess the regional adaptation of wine grape cultivars to 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. The trial was designed to evaluate up to 20 cultivars or advanced selections at four 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 2006 growing season.

Materials and Methods

The vines were spaced 8 ft × 10 ft apart (545 vines/acre) with three vines/replication. Treatments were replicated four times at each site (12 vines/cultivar). Vines were trained to the 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 or trailing growth habit are being trained to the top wire, while those with a semi-upright to upright growth habit were trained to the vertical shoot positioning (VSP) system.

In late September 2005, shoots were rated for periderm formation (when shoots become lignified and turn brown) based on the amount

of development that had occurred on the primary shoots. In the spring, vines were pruned, the 1-year-old trimmings were weighed, and the amount of established 2-year-old cordon was measured. During the growing season, vines at all the sites were exposed to 2,4-D herbicide drift and were rated for the severity of injury. Following *veraison* (when the grape berry changes color), berry samples were collected from the mid-cluster position to test for maturity based on percentage soluble solids (SS), pH, and titratable acids (TA). Time of harvest was based upon these measurements and either local winery requirements or fruit condition. At harvest, the number of clusters per vine were counted and weighed.

Results and Discussion

During the study, several significant freezes have occurred and have influenced the vine establishment and productivity (Table 1). Dormant period frosts or freezing events were recorded on October 8 and December 7 or 9, 2005, and February 18 and April 26 or May 6, 2006.

Generally, periderm development was more advanced at NERF than at the other sites (Table 2). However, those vines had ceased vegetative growth earlier than at the other sites in 2005. Vines at SERF were under draught conditions for much of the 2005 growing season and also tended to have high rates of periderm formation. For those cultivars planted in 2003 or 2004, NY76.0844.24, NY84.0101.04, and Vidal Blanc were the slowest in developing the periderm. Base upon pruning weights, vines grew the best in 2005 at HRS and ARF (Table 2). Cultivars that tended to have high pruning weights across all sites included La Crescent, Prairie Star, and Leon Millot. Marquette (MN-1211) vines grew relatively well at HRS, but not at the other sites where vines characteristically had spindly trunks and

were generally weak. Among the 15 cultivars from the cultivar by management study, St. Croix and Frontenac had higher pruning weights than the other cultivars at SERF and NERF. After three growing seasons, the amount of established cordon per vine reflected the growing conditions at the sites, differences in exposure to freezing events, and the development of the periderm (Table 3). Vines at ARF experienced some of the mildest freezing events, and most frequently had the greatest amount of established cordon per vine. Most often, cultivars that were slow in developing a periderm had less of an established cordon. Across sites, La Crescent, Prairie Star, and Leon Millot had the greatest amount of established cordon among the 20 cultivars being evaluated at all the sites. Among the 15 cultivars from the 2002 cultivar by management system study, Frontenac, St. Croix, and La Crosse had the greatest amount of established cordon at both sites.

Vines at each of the sites were exposed to 2,4-D drift during the growing season (Table 3). Vines at ARF followed by NERF exhibited the most severe symptoms. Among cultivars, NY76, Swenson White, and Esprit exhibited the most severe symptoms at each of the sites. Of concern is the severity of symptoms exhibited by Marquette (MN-1211) at ARF. Among the 15 cultivars from the 2002 study, Vanessa and Cynthiana exhibited the most severe symptoms, followed by Maréchal Foch.

The 2006 growing season was the first time vines in this study were allowed to carry a crop. The growing season was characterized by above normal temperatures in July and frequent rains during the harvest period. When testing for maturity on a weekly basis, SS often exhibited little change while TA declined. As a result, some harvest dates varied considerably between sites (Tables 4 and 5). Yields per vine were generally the highest at ARF followed in order by HRS, SERF, and NERF (Tables 4 and 5).

Among the 20 cultivars planted at all sites, Esprit vines produced relatively high yields across each of the sites. Cayuga White was relatively productive at the warmer sites (ARF and SERF) but not at the colder sites. Vidal Blanc was productive at ARF but not at any of the other sites. Among 15 cultivars from the 2002 study planted at SERF and NERF, Frontenac and St. Croix produced relatively high yield at both sites while Seyval Blanc produced a high yield at SERF but not at NERF. Average cluster weight tended to be similar for a cultivar across each of the sites. The notable exception was with St. Vincent that produced larger clusters at ARF and SERF than at HRS and NERF.

Acknowledgments

Thanks to the Iowa Department of Agriculture and Land Stewardship and the Iowa Grape Growers Association for providing support to establish these plantings through a specialty crops grant and the Iowa Grape and Wine Commission for continued funding. Thanks to the staff at the ISU Horticulture Station, the Armstrong, Southeast, and Northeast Research Farms, the Muscatine Island Research Farm, and to summer employees Sara Marolf and Lisa Wasko for their assistance in maintaining the plantings.

Table 1. Significant minimum temperatures (°F) recorded at the ISU research farms during the study.

Date	HRS	ARF	SERF	NERF
Oct. 2, '03	26	30	21	21
Jan. 6, '04	-5	-11	-11	-5
Jan. 27–Feb. 1, '04	-12	-11	-12	-19
May 3, '04	28	32	31	28
Oct. 4, '04	29	28	28	27
Dec. 23, '05	-12	-9	-3	-16
Jan. 16, '05	-14	-11	-6	-19
Mar. 13, '05	10	12	13	9
Apr. 30–May 3, '05	24	29	24	21
Oct. 8, '05	26	28	32	30
Dec. 7–9, '05	-16	-10	-12	-16
Feb. 18, '06	-15	-10	-10	-20
Apr. 26–May 6, '06	28	37	31	31

Table 2. Periderm formation in 2005 and 2006 pruning weight for 20 cultivars in the ISU 2003 wine grape cultivar trial planted in 2003 at the Horticulture Research Station (HRS) and the Armstrong Research Farm (ARF), and 35 cultivars at the Southeast (SERF), and Northeast (NERF) Research Farms.

Treatment	2005 Periderm formation ^z				Pruning weight (lb)			
	HRS	ARF	SERF	NERF	HRS	ARF	SERF	NERF
GR-7	4.6	5.0	4.6	4.8	1.8	1.4	.6	.2
Noiret ^y	4.1	5.0	4.0	5.0	1.1	1.9	.3	.3
NY76.0844.24 ^y	1.3	2.3	3.7	4.6	.5	.2	.1	.1
NY84.0101.04	2.9	4.0	3.9	4.6	1.0	1.4	.2	.1
Corot noir ^v	3.9	5.0	3.9	4.8	1.3	1.7	.3	.1
La Crescent	4.9	5.0	4.8	5.0	2.3	2.2	.7	.8
Prairie Star	4.9	5.0	4.8	4.8	1.5	2.6	.9	.4
Frontenac Gris ^x	4.3	.	.	.	.6	.	.	.
Swenson White ^w	2.5	3.9	4.1	5.0	.1	.1	.1	.1
Briana ^y	4.2	4.2	4.2	4.8	.6	.7	.1	.1
Marquette ^{y, v}	3.8	4.2	4.2	4.3	.8	.4	.1	.1
MN-1198 ^y	4.0	4.3	4.3	5.0	.4	.2	.1	.1
Cayuga White	3.7	4.7	4.3	4.8	.6	1.9	.7	.1
Chancellor	3.1	4.8	3.9	4.6	.6	1.9	.2	.1
De Chaunac	4.8	5.0	4.5	5.0	1.5	2.2	.2	.2
Esprit	5.0	5.0	4.9	5.0	1.7	2.1	.7	.2
Landot 4511	3.4	4.7	4.3	4.8	.8	1.3	.4	.2
Leon Millot	4.6	4.3	4.3	5.0	1.5	2.3	1.4	.8
St. Vincent	4.3	5.0	4.5	3.9	1.6	2.5	.4	.1
Vidal Blanc	2.5	4.3	3.2	3.7	.8	1.7	.2	.1
Maréchal Foch			4.0	5.0			.5	.3
Frontenac			5.0	5.0			.9	.7
Cynthiana			4.2	4.8			.2	.1
St. Croix			4.8	5.0			1.1	.6
Chambourcin			4.2	4.7			.4	.2
Seyval Blanc			4.5	4.3			.3	.1
La Crosse			4.6	5.0			.4	.4
Vignole			4.1	3.8			.3	.1
Traminette			3.8	4.1			.1	.2
Edelweiss			4.5	4.7			.3	.4
Marquis			3.8	4.2			.1	.1
Vanessa			4.4	4.9			.2	.1
Reliance			4.0	5.0			.5	.3
Mars			4.9	5.0			.7	.2
Jupiter			3.8	3.9			.1	.1
LSD, P<.05	.6	.3	.4	.5	.5	.3	.3	.2

^zPeriderm rating scale 0–5: 0=none of the primary shoot was lignified; 1=1 to 20% of the shoot length was lignified; 2=21 to 40% lignified; 3=41 to 60% was lignified; 4=61 to 80% lignified; 5=81 to 100% lignified.

^yPlanted in 2004.

^xPlanted in 2004 at the Horticulture Research Farm and in 2006 at the other sites.

^wPlanted in 2005.

^vNamed and released in 2006: Noiret (NY73.136.17); Corot noir (NY70.0809.10); and Marquette (MN-1211).

Table 3. Cordon establishment after pruning, and 2,4-D injury rating in 2006 for 20 cultivars in the ISU wine grape cultivar trial planted in 2003 at the Horticulture Research Station (HRS) and the Armstrong Research Farm (ARF), and 35 cultivars at the Southeast (SERF), and Northeast (NERF) Research Farms.

Treatment	Feet of cordon per vine				2,4-D injury rating ^z			
	HRS	ARF	SERF	NERF	HRS	ARF	SERF	NERF
GR-7	6.8	7.3	3.5	2.7	1.1	1.7	1.1	1.2
Noiret ^w	5.0	7.2	4.3	2.0	1.2	1.4	1.0	1.3
NY76.0844.24 ^z	.9	.5	.8	.0	3.4	4.7	2.9	4.5
NY84.0101.04	.2	5.7	.4	.5	1.1	2.8	1.3	3.2
Corot noir ^w	5.2	7.0	4.5	1.7	1.1	1.5	1.0	1.7
La Crescent	7.7	7.8	6.7	7.9	1.0	2.4	1.0	1.1
Prairie Star	6.8	7.6	5.6	6.3	1.8	2.9	1.3	2.3
Frontenac Gris ^y	5.3	.	.	.	1.0	1.1	1.0	1.0
Swenson White ^x	.0	.9	.0	.0	3.1	4.6	1.6	4.1
Briana ^z	6.0	4.2	3.6	.7	1.0	1.5	1.1	1.7
Marquette ^{z, w}	7.9	3.9	.0	.3	1.7	3.0	1.3	2.1
MN-1198 ^z	4.5	1.7	1.0	.2	1.0	2.9	1.2	1.5
Cayuga White	4.4	7.5	6.3	1.0	1.0	1.8	1.0	1.3
Chancellor	2.7	7.3	2.3	1.1	1.0	1.0	1.0	1.2
De Chaunac	6.7	7.8	4.0	3.6	1.0	1.1	1.1	1.0
Esprit	7.6	7.7	5.5	3.2	3.9	3.1	2.2	3.7
Landot 4511	2.2	7.3	4.8	.4	2.5	2.9	1.0	2.6
Leon Millot	7.2	7.7	6.2	5.4	2.8	3.8	1.6	3.3
St. Vincent	6.3	6.5	4.8	.5	1.0	1.0	1.0	1.0
Vidal Blanc	.0	7.8	2.6	.1	1.0	1.4	1.0	1.4
Maréchal Foch			4.0	3.8			2.6	3.0
Frontenac			5.5	7.3			1.0	1.0
Cynthiana			3.2	.2			2.8	3.8
St. Croix			5.5	6.6			1.1	1.3
Chambourcin			3.6	1.3			1.0	1.0
Seyval Blanc			4.2	.9			1.0	1.1
La Crosse			4.9	6.5			1.0	1.0
Vignole			4.3	1.9			1.0	1.3
Traminette			2.8	.3			1.3	1.9
Edelweiss			5.9	2.9			1.6	3.2
Marquis			.7	.0			1.6	2.8
Vanessa			4.2	1.7			2.9	4.1
Reliance			5.2	2.9			1.8	2.1
Mars			5.1	1.3			1.5	2.3
Jupiter			1.7	.0			2.3	3.0
LSD, P<.05	1.9	.9	1.9	1.6	.4	.4	.4	.6

^zPlanted in 2004.^yPlanted in 2004 at the Horticulture Research Farm and in 2006 at the other sites.^xPlanted in 2005.^wNamed and released in 2006: Noiret (NY73.136.17); Corot noir (NY70.0809.10); and Marquette (MN-1211).

Table 4. Fruit yield and harvest characteristics in 2006 for 20 cultivars in the ISU wine grape cultivar trial planted in 2003 at the Horticulture Research Station and the Armstrong Research Farm.

Treatment	Horticulture Research Station						Armstrong Research Farm					
	Date	% SS	pH	TA ^z	Yield /vine (lb)	Cluster wt (lb)	Date	% SS	pH	TA ^z	Yield /vine (lb)	Cluster wt (lb)
GR-7	9.3	19.5	3.62	8.1	3.2	.23	9.4	20.0	3.75	10.2	8.5	.23
Noiret ^v	10.4	19.7	.	.	.1	.15	10.2	19.6	4.11	8.4	10.7	.37
NY76.0844.24 ^y	.	.	.	.	.	.	9.2	16.2	3.50	8.3	.3	.35
NY84.0101.04	.	.	.	.	.	.	8.29	19.1	3.54	8.4	11.5	.46
Corot noir ^v	9.20	18.2	3.41	7.5	3.3	.48	9.2	18.0	3.62	7.1	10.8	.47
La Crescent	9.6	22.5	3.28	9.9	2.8	.20	8.21	21.9	3.58	13.2	10.3	.24
Prairie Star	8.28	18.2	3.70	6.8	5.5	.28	8.22	18.1	3.76	6.8	10.1	.24
Frontenac Gris ^x	9.13	25.3	3.48	9.3	2.5	.22	.	.	.	.	.	.
Swenson White ^w	.	.	.	.	.	.	8.23	18.2	3.83	8.0	.6	.34
Briana ^y	8.24	20.0	3.68	5.4	3.0	.28	8.23	21.1	3.86	7.5	5.4	.23
Marquette ^{y, v}	8.31	24.3	3.40	8.1	2.4	.19	8.20	23.4	3.48	12.2	1.9	.12
MN-1198 ^y	9.20	22.4	3.28	8.8	2.0	.29	8.20	22.7	3.40	10.4	1.3	.21
Cayuga White	9.19	20.2	3.37	5.9	1.0	.43	8.29	19.0	3.55	7.8	15.3	.52
Chancellor	10.4	20.2	3.46	8.4	.7	.21	10.2	23.0	4.16	9.8	7.2	.17
De Chaunac	10.4	20.2	3.45	9.3	.8	.10	9.25	20.1	3.72	9.9	6.8	.13
Esprit	9.13	18.7	3.55	7.7	5.0	.57	9.4	17.9	3.70	8.9	20.7	.63
Landot 4511	9.19	23.4	.	.	.3	.17	8.22	17.4	3.54	8.7	6.0	.19
Leon Millot	8.24	20.1	3.66	6.1	2.1	.16	8.21	21.3	3.80	7.5	10.7	.21
St. Vincent	10.4	20.8	3.10	11.3	1.4	.31	10.9	20.8	4.01	11.0	8.2	.45
Vidal Blanc	.	.	.	.	.	.	9.25	20.2	3.66	5.5	17.4	.61
LSD, P<.05					1.5	.08					3.1	.08

^zTitrateable acids reported in grams/liter.^yPlanted in 2004.^xPlanted in 2004 at the Horticulture Research Station and in 2006 at the other sites.^wPlanted in 2005.^vNamed and released in 2006: Noiret (NY73.136.17); Corot noir (NY70.0809.10); and Marquette (MN-1211).

Table 5. Fruit yield and harvest characteristics in 2006 for 35 cultivars in the ISU wine grape cultivar trial planted in 2003 at the Southeast and Northeast Research Farms.

Treatment	Southeast Research Farm						Northeast Research Farm					
	Date	% SS	pH	TA ^z	Yield /vine (lb)	Cluster wt (lb)	Date	% SS	pH	TA ^z	Yield /vine (lb)	Cluster wt (lb)
GR-7	8.25	20.9	4.16	4.9	2.9	.16	8.25	21.0	3.39	12.4	.3	.11
Noiret ^v	10.10	19.6	3.76	5.0	5.1	.25	10.4	22.2	3.58	7.7	.4	.27
NY76.0844.24 ^y	.	.	.	.	.	.	.	.	.	.	.	.
NY84.0101.04	8.25	18.7	3.17	7.4	1.0	.21	.	.	.	.	.	.
Corot noir ^v	10.10	21.4	3.96	4.4	7.4	.35	10.4	20.0	3.61	6.5	.6	.35
La Crescent	9.29	26.0	3.75	7.4	2.6	.16	8.26	24.0	3.45	10.8	3.2	.29
Prairie Star	8.25	17.8	3.41	7.7	4.5	.25	8.25	18.0	3.68	6.0	2.6	.32
Frontenac Gris ^x	.	.	.	.	.	.	.	.	.	.	.	.
Swenson White ^w	.	.	.	.	.	.	.	.	.	.	.	.
Briana ^y	8.25	20.0	3.37	5.7	1.7	.18	8.25	22.0	3.63	7.5	.4	.22
Marquette ^{y, v}	.	.	.	.	.	.	.	.	.	.	.	.
MN-1198 ^y	9.29	23.6	3.46	7.5	.6	.14	9.6	24.0	.	.	.1	.20
Cayuga White	8.25	16.6	3.01	9.2	13.0	.46	9.15	21.0	3.42	4.2	.2	.41
Chancellor	10.10	22.0	3.54	5.4	3.5	.17	10.4	23.2	3.58	7.7	1.1	.24
De Chaunac	9.29	21.8	3.36	5.1	1.8	.19	9.6	22.0	3.39	9.3	1.6	.24
Esprit	9.29	21.3	3.85	5.2	8.8	.53	9.21	22.0	3.75	7.4	1.8	.61
Landot 4511	9.29	24.2	3.90	3.7	7.1	.27	9.28	23.0	.	.	.1	.
Leon Millot	8.25	19.9	3.18	7.7	5.0	.17	8.25	21.0	3.57	7.1	1.2	.13
St. Vincent	10.10	19.7	3.06	7.5	8.2	.50	10.4	20.0	3.61	6.5	.3	.27
Vidal Blanc	10.10	24.3	3.74	6.0	2.5	.44	.	.	.	.	.	.
Maréchal Foch	8.25	19.1	3.03	8.4	1.4	.10	8.31	22.0	3.57	5.4	.9	.14
Frontenac	9.29	25.3	3.39	9.0	6.8	.20	9.15	24.5	3.37	12.2	3.3	.32
Cynthiana	10.10	24.6	3.47	11.0	1.9	.15	.	.	.	.	.	.
St. Croix	9.26	21.3	4.16	4.0	5.8	.18	8.25	20.2	3.49	10.2	2.4	.21
Chambourcin	10.10	25.5	3.46	5.9	5.0	.41	10.4	23.8	3.48	6.5	.3	.52
Seyval Blanc	8.25	26.7	3.57	8.4	9.0	.52	9.6	23.0	3.45	6.9	.6	.40
La Crosse	9.26	22.4	3.33	5.3	4.1	.18	8.31	20.3	3.43	10.7	3.4	.27
Vignole	10.10	27.0	3.24	7.2	3.4	.17	9.13	22.0	3.40	10.3	.3	.14
Traminette	9.1	18.3	2.85	5.5	1.9	.23	.	.	.	.	.	.
Edelweiss	8.25	16.9	3.25	6.0	3.2	.28	8.18	16.0	3.33	13.5	2.1	.37
Marquis	8.25	13.9	6.06	5.7	1.1	.35	.	.	.	.	.	.
Vanessa	8.21	19.0	3.60	4.7	1.3	.33	.	.	.	.	.	.
Reliance	9.1	19.4	3.65	5.4	4.7	.	8.25	21.5	3.45	5.7	.4	.21
Mars	9.1	19.0	3.48	5.1	3.4	.20	8.25	18.0	3.47	6.0	.6	.20
Jupiter	8.21	20.4	3.91	3.1	1.7	.26	.	.	.	.	.	.
LSD, P<.05					2.4	.09					.8	.06

^zTitrateable acids reported in grams/liter.^yPlanted in 2004.^xPlanted in 2004 at the Horticulture Research Station and in 2006 at the other sites.^wPlanted in 2005.^vNamed and released in 2006: Noiret (NY73.136.17); Corot noir (NY70.0809.10); and Marquette (MN-1211).