

NE-1020 Wine Grape Cultivar Trial
2014 Report
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Two wine grape cultivar plantings were established in the spring of 2008 as part of the national NE-1020 project at two locations. The first location is at the Lake Erie Regional Grape Research & Extension Center (LERGREC) in North East, PA in Erie County. The second location is at the Fruit Research and Extension Center in Biglerville, PA in Adams County. Both plantings were planted at 6 feet in row and 9 feet between rows in a randomized complete block design with 4 vine panels and six replications. Two “core cultivars” were based upon climatic differences. For the FREC site they were Cabernet sauvignon and Merlot and for LERGREC they were Chambourcin and Vidal blanc. The vines were pruned annually and managed as either a VSP system (*vinefera types*) or a high wire system (*hybrids*). The varieties are listed in Table 1 along with the harvest dates for their respective sites in 2014. At LERGREC Malbec was originally planted but replaced in 2014 due to the winter injury damage and replaced with Dornfelder. MN 1189 and Noiret were planted in 2009 and as such are not part of the NE-1020 reporting project. The majority of the cultivars at LERGREC are hybrids and those at FREC are mostly vinefera types; because of these differences we are presenting the viticultural results as two separate sections in the report.

Materials & Methods

The following measurements were collected as in previous years according to protocol established by the NE-1020 project.

Data	Procedure
<i>Dormant & Early Growing Season</i>	
Grown Pruning weight	bundle and weigh 1st year canes from individual vines.
Cordon Length/vine	Measure length of cordon
Retained nodes	Count number of buds remaining after pruning; excluding renewal spurs.
Nodes with live buds	Count number of retained spur or cane buds that have produced live shoots at 4-6 in shoot growth.
Shoots per vine	Count all live shoots, excluding renewals - includes 2ndaries that push.
Derived values:	
Bud survival	Nodes with live buds/retained nodes
(Ravaz Index)	Divide Yield (g/vine) by Pruning weight(g)
Shoots/meter of row	Shoots per vine / in-row vine spacing (M)
Shoots per retained node	Total Shoots per vine/ No. retained nodes

Midseason crop adjustment when shoot and/or cluster thinning is used to adjust cropping levels, we made note of these adjustments.

Specific Data Needed	Procedure	Measurement units
<i>In-season crop adjustment</i>		
Post-thinning shoots per vine	After shoots adjusted to 4-5 primaries per foot	Primary shoots remaining per vine
Pre-thinning Cluster counts	count total number of clusters on each count vine before cluster thinning, around bloom	clusters per vine
Post-thinning cluster counts (optional -can do these with harvest)	count cluster number after thinning	retained clusters per vine

In addition in 2014 the following data was also collected due to the severe winter at the LERGREC site.

<i>Acclimation and Cold Hardiness</i>	
Bud injury	Collect several canes/unit; cut open 100 buds, count dead primaries
Trunk/cordon injury	Comment on incidence of trunk and cordon injury.
Crown gall	Evaluate and record incidence in mid-summer, after crown gall has the chance to express itself

An ANOVA was performed on all data for both sites and if significant the Tukey-Kramer mean separation test was run on the means. Within the tables values in columns followed by the same letters are not significantly different from each other.

The winter of 2013-14 was an unusually harsh winter there were several subzero days in January and February resulting in vine deaths or winter killing of the cordons. At LERGREC the coldest day occurred on 7 January with the minimum temperature of -10.9°F; additionally there were a total of 9 days in January and February when the minimum recorded temperature was below 0°F. At FREC there was only one day with a recorded temperature below 0°F reaching -2.9°F, however, there were 15 days when the minimum temperature was in the single digits.

LERGREC Results

Growth Parameters: All the growth parameter data for LERGREC were collected in 2014 growing season except for the Ravaz Index which reflects 2013 season yields divided by dormant pruning weight of 2014. Cabernet franc, Gruner Veltliner, Muscat Ottonel, Pinot grigio, Pinot noir and Syrah all had severe trunk and cordon injury on all vines in all replications from the severe winter cold. The effects of the cold winter at LERGREC can be seen in the number of nodes with live buds (Table 2). Syrah and Pinot noir averaged only 0.1 and 1.7, live buds/vine respectively. Other cultivars damaged included Gruner Veltliner (5.0), Pinot grigio (7.1) and Cabernet franc (9.2). Chancellor did not show severe damage and had the most nodes with live buds per vine at 75.8. Two of the Minnesota cultivars, La Crescent and Marquette also came through the winter with minimal damage. Dormant pruning weight, a measure of overall vine vigor from the 2013 season, was quite variable with the highest weight of wood on Cabernet franc (3.39 lb.) and the lowest was on NY 81.0315.17 (1.94). There were no differences in overall cordon length between cultivars. Dormant nodes retained per vine was greatest on Marquette and least on the

four cultivars that showed the most injury. These four were also the ones that had the fewest number of shoots to begin to grow. In general few shoots were thinned during the growing season because we felt it was important to leave as much canopy to help the vines to recover from the harsh winter. The Ravaz Index indicates overall growth balance and should be between 10 and 11 (1). Marquette and Vidal blanc vines were within that range. Chambourcin were slightly above and NY 81 were slightly below. We continue to struggle with excessive vigor for some of the cultivars and excessive cropping for others. The required randomized block design and different training systems is making it difficult to uniformly manage each cultivar.

Yield: Chancellor had the highest yield (lb./vine) with the most average number of clusters per vine (Table 3). This occurred largely due to the fact the vines were over cropped and were not thinned. Chambourcin had the lowest yield but similar to MN 1235, Norton, NY 81.0315.17, Traminette and Vidal blanc. Crop density (#clusters/foot) was greatest for Chancellor and least for Chambourcin. Average berry weight and cluster weight and was also highest for Chambourcin. Number of berries per cluster was greatest for Chambourcin and Vidal blanc.

Berry Quality: Berry pH at harvest were all in the mid 3.0's (Table 4). Titratable acidity of the berries was highest for Norton with the rest coming in between 7.6 and 10.6 g/L. At harvest, with the exception of the Chancellor, brix was all above 20%. MN 1235 produced the smallest individual berries but was similar to Marquette and Norton. Fruitfulness based upon vine yield per node of cordon left from dormant pruning was greatest on Chancellor but similar to that on Vidal blanc and MN 1235.

Winter Hardiness: Bud survival were completely opposite in 2014 from 2013. In 2013 the vast majority of the percent bud survival was in the 80 to 90 percent range (Table 5). In 2014 only Chancellor had a survival rate above 80% and Syrah had for all intents and purpose no bud survival. Tannat sustained extensive bud and trunk damage. Shoots growing from above the graft union were therefore trained to be used as new trunk and cordons for the 2015 season. The cultivars from the Minnesota breeding program fared the best of the remaining cultivars. Crown gall symptoms also increased as a result of the damage from the 2014 winter, with 62% of the Cab. franc vines exhibiting symptoms and a total of five cultivars having increases over the previous year.

FREC Results

Growth Parameters - In general the planting at FREC fared much better than the planting at LERGREC since they did not have the extreme cold temperatures that occurred along Lake Erie. Vigor, as measured by dormant pruning weight was greatest for Malbec and lowest on Chambourcin and Chancellor (Table 6). Chambourcin also had the shortest cordon length. There were no differences in average number of nodes/vine or number of nodes with live buds. However, the number of nodes with live buds was definitely less than total number of nodes indicating there was some winter injury. Most of the winter injury showed up later in the growing season. All the cultivars required some shoot thinning during the season except Tannat. Post thinning shoot counts were highest for Chancellor. Tannat had only 0.3 shoots per foot of canopy post thinning followed by Malbec and Syrah. The low number of shoots was the result of extensive winter injury and the need to replace the trunks and cordons with shoots that developed from above the graft union. Our goal was to achieve a shoot density of 4 to 5 per foot and in most cases we were within that range with the exception being Chancellor at 7.4 and Tannat and Malbec being 0.3 and 2.5, respectively.

Harvest Data – Yield per vine was essentially non-existent on Tannat due to winter injury; whereas it was greatest on Chancellor (Table 7). Other heavy yielding cultivars included Chambourcin, Barbera, and Gruner Veltliner. Cluster thinning was performed on all cultivars except Tannat. Average number of clusters harvested/vine was lowest on Tannat. Barbera produced large clusters with large

fruit. Small cluster producing cultivars included Albarino, Malbec, Petit manseng, Petit verdot and Pinot noir. The Ravaz Index indicated that most of the cultivars were under cropped for their vigor; while Chambourcin and Chancellor were over cropped for their vigor.

Berry Quality: As with the planting in Erie juice pH at harvest was mainly in the 3's with the exception of Muscat Ottonel at 4.09 and Viognier at 4.07 (Table 8). Muscat Ottonel produced large berries but had a low number of berries per cluster with Merlot having the greatest number of berries/cluster. Fruitfulness based upon gram of fruit produced per retained node was greatest for Chambourcin

Winter Hardiness As mentioned before, while no vines appeared injured when dormant pruning was completed several did collapse later during the growing season including Syrah. (See attached images)

Usefulness of Findings

The two plantings are coming into mature production age and should provide valuable information on the productiveness of these cultivars. The winter of 2014 provided valuable information on winter hardiness under the most severe conditions experienced in 20 years. There were 9 days when minimum temperatures at LERGREC were below zero in January and February with absolute minimum of -10.9 occurring on January 7, 2014. At FREC there was only one day when temperatures were below zero also occurring on January 7 at -2.9. However, there were 15 days when the minimum temperature was in the single digits in January and February at FREC. The Minnesota cultivars show promise as being good selections for the colder regions of Pennsylvania. Tannat, Syrah and Malbec are questionable selections for wine production even in the more milder conditions of south central Pennsylvania. Vigor control at FREC has been a problem but this year we have instituted a regime of hedging the vines mechanically resulting in much better light exposure for the fruit.

Reference

1. Reynolds, A., T. Wolf. 2008. Grapevine canopy measurement. *In* Wine Grape Production Guide for Eastern North America. NRAES publication 145. pages 124-134.

Table 1. Listing of cultivars at Lake Erie Grape Research & Extension Center and at Fruit Research & Extension Center in the two NE-1020 Wine Grape Cultivar Trials and their 2014 harvest dates

LERGREC		FREC	
Cultivar	2014 Harvest Date	Cultivar	2014 Harvest Date
Cab. franc		Albarino	10/8
Chambourcin	10/27	Barbera	10/16
Chancellor	10/15	Cab. franc	10/21
Gruener Veltliner		Cab. Sauvignon	10/21
La Crescent	9/24	Chambourcin	10/27
Marquette	9/29	Chancellor	10/16
MN 1189	9/22	Gruener Veltliner	10/6
MN 1235	10/1	Lemberger	10/14
Muscat Ottonel		Malbec	10/2
Noriet	10/9	Merlot	10/6
Norton	11/3	Muscat Ottonel	9/16
NY 81.0315.17	10/10	Petit Manseng	10/2
Pinot grigio		Petit Verdot	10/29
Pinot noir		Pinot grigio	9/18
Syrah		Pinot noir	9/18
Traminette	10/10	Sangiovese	10/28
Vidal blanc	10/27	Syrah	10/20
Dornfelder	*	Tannat	10/1
MN 1189	**	Traminette	10/2
Noiret	**	Viognier	10/1

*Replacement for Malbec in 2014

**Vines planted in 2009 & not part of overall study

Table 2. Growth data for wine grape cultivars planted at LERGREC in 2014 and Ravaz index for the 2014 cropping year

Cultivar	2014 Dormant Pruning wt./vine, lb.	Cordon Length/Vine, ft.	Avg. # Nodes Retained/Vine	Avg. # Nodes With Live Buds/Vine	Avg. # Shoots/Vine, Pre Thinning	Avg. # Shoots/Vine Post Thinning	Avg. # Shoots/foot, Pre Thinning	Avg. # Shoots/foot Post Thinning	Ravaz Index 2014 yield/2015 pruning wt.
Cab. franc	3.39 b	5.4 a	58.2 ab	9.2 ab	11.5 ab	11.5 bc	2.1 ab	2.1 ab	
Chambourcin	1.06 a	5.0 a	60.5 ab	29.0 cde	39.2 cd	39.2 def	7.8 cd	7.8 de	13.4 d
Chancellor	2.21 ab	5.4 a	91.5 cd	75.8 g	96.7 f	53.0 g	17.9 g	9.8 ef	22.6 e
Gruener Veltliner	2.00 ab	5.5 a	50.4 a	5.0 ab	8.2 a	8.2 abc	1.5 a	1.5 ab	
La Crescent	1.42 ab	5.6 a	82.9 bcd	60.4 fg	85.8 f	47.4 efg	15.5 fg	8.8 ef	10.0 cd
Marquette	2.48 ab	5.3 a	101.0 d	70.5 g	91.7 f	50.0 fg	17.3 g	9.5 ef	6.9 abc
MN 1235	2.15 ab	4.8 a	54.3 ab	43.1 ef	61.4 e	50.4 g	12.8 ef	10.5 f	7.0 abc
Muscat Ottonel	2.51 ab	6.3 a	69.0 abc	12.1 abc	17.3 ab	17.3 c	3.0 ab	3.0 bc	
Norton	2.87 ab	5.4 a	61.3 ab	38.8 de	55.5 de	47.7 efg	10.4 de	8.9 ef	2.5 a
NY 81.0315.17	1.04 a	5.4 a	74.8 abcd	21.5 bcd	29.1 bc	29.1 d	5.4 bc	5.4 cd	9.0 bcd
Pinot grigio	1.66 ab	5.6 a	45.8 a	7.1 ab	7.9 a	7.9 abc	1.4 a	1.4 ab	
Pinot noir	1.61 ab	5.4 a	50.4 a	1.7 a	1.8 a	1.8 ab	0.3 a	0.3 a	
Syrah	2.85 ab	6.3 a	47.0 a	0.1 a	0.1 a	0.1 a	0.0 a	0.0 a	
Traminette	3.12 ab	5.2 a	65.6 abc	34.2 de	53.8 de	53.8 g	10.5 de	10.5 f	3.9 ab
Vidal blanc	1.49 ab	5.0 a	53.6 ab	30.5 de	38.0 cd	38.0 de	7.6 cd	7.6 de	10.6 cd
P-Value	0.0012	0.0738	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

Letters refer to Tukey-Kramer Mean Separation, P=0.05

Table 3. Yield data for wine grape cultivars at LERGREC in 2014

Cultivar	Yield /Vine, lb.	# Clusters Harvested/Vine	# Clusters/Vine, Pre Thin	# Clusters/Vine, Post Thin	# Clusters Harvested/ft	Avg. Berry wt, g	Avg. Cluster wt, g	Berries/Cluster	Fruitfulness, g/node
Cab. franc	*								
Chambourcin	15.1 abc	27 a	na	na	5.5 a	2.9 e	251 f	88 e	113 ab
Chancellor	40.2 d	136 f	na	na	25.2 f	2.1 c	135 d	64 cd	208 c
Gruener Veltliner									
La Crescent	17.0 bc	92 de	na	na	16.6 de	1.5 b	84 bc	55 bc	95 ab
Marquette	20.3 c	118 ef	na	na	21.7 ef	1.5 ab	79 ab	53 abc	85 ab
MN 1235	15.5 abc	75 cd	na	na	15.8 cd	1.3 a	96 bc	71 d	131 abc
Muscat Ottonel									
Norton	7.8 a	60 bc	na	na	11.2 bc	1.4 ab	58 a	42 a	58 a
NY 81.0315.17	8.2 a	42 ab	na	na	7.7 ab	2.0 c	90 bc	44 ab	50 a
Pinot grigio									
Pinot noir									
Syrah									
Traminette	11.4 ab	50 abc	na	na	9.7 ab	2.3 d	103 c	45 ab	79 a
Vidal blanc	20.0 c	46 ab	na	na	9.4 ab	2.3 d	193 e	84 e	179 bc
P-Value	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

Letters refer to Tukey-Kramer Mean Separation, P=0.05

*No value indicates there were no fruit produced due to winter injury in winter of 2014

na = not available, error in data collection

Table 4. Berry quality measurements at harvest of cultivars at LERGREG in 2014

Cultivar	pH	TA, g/L	SS, %	Berry wt, g	Avg. Cluster wt, g	Berries/Cluster	Fruitfulness, g/node
Cab. franc	*						
Chambourcin	3.47 abc	10.5 b	20.97 b	2.9 e	251 f	88 e	113 ab
Chancellor	3.44 ab	9.3 b	18.72 a	2.1 c	135 d	64 cd	208 c
Gruener Veltliner							
La Crescent	3.54 bcde	10.2 b	23.30 cd	1.5 b	84 bc	55 bc	95 ab
Marquette	3.51 bcd	10.2 b	23.66 d	1.5 ab	79 ab	53 abc	85 ab
MN 1235	3.63 e	10.6 b	22.98 cd	1.3 a	96 bc	71 d	131 abc
Muscat Ottonel							
Norton	3.38 a	23.6 c	21.58 bc	1.4 ab	58 a	42 a	58 a
NY 81.0315.17	3.60 de	7.6 a	21.10 b	2.0 c	90 bc	44 ab	50 a
Pinot grigio							
Pinot noir							
Syrah							
Traminette	3.58 cde	9.1 ab	20.32 ab	2.3 d	103 c	45 ab	79 a
Vidal blanc	3.52 bcde	9.2 ab	23.28 cd	2.3 d	193 e	84 e	179 bc
P-Value	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

Letters refer to Tukey-Kramer Mean Separation, P=0.05

*No value indicates there were no fruit produced due to winter injury in winter of 2014

Table 5. Percent bud survival and vines showing crown gall symptoms of wine grape cultivars in 2013 and 2014 at LERGREG

Cultivar	2013		2014	
	% Bud Survival	% Crown Gall	% Bud Survival	% Crown Gall
Cab. franc	93.5 a	0.0 a	15.8 bc	62.5 c
Chambourcin	95.5 a	0.0 a	47.2 d	0.0 a
Chancellor	96.4 a	0.0 a	83.1 h	0.0 a
Gruener Veltliner	93.1 a	0.0 a	9.7 ab	50.0 bc
La Crescent	94.8 a	0.0 a	73.2 gh	0.0 a
Marquette	95.4 a	0.0 a	69.3 fgh	0.0 a
MN 1235	96.6 a	0.0 a	79.7 h	0.0 a
Muscat Ottonel	88.7 a	16.7 ab	17.3 bc	33.3 abc
Norton	92.4 a	0.0 a	63.3 efg	0.0 a
NY 81.0315.17	94.6 a	0.0 a	28.6 c	12.5 a
Pinot grigio	91.8 a	8.3 a	14.1 abc	25.0 ab
Pinot noir	94.8 a	37.5 b	3.0 ab	33.3 abc
Syrah	72.4 b	33.3 b	0.1 a	12.5 a
Traminette	94.1 a	0.0 a	52.2 de	8.3 a
Vidal blanc	89.4 a	0.0 a	56.8 def	0.0 a
P-Value	0.0001	0.0001	0.0001	0.0001

Letters refer to Tukey-Kramer Mean Separation, P=0.05

Table 6. Growth data for wine grape cultivars at FREC in 2014 and Ravaz Index for 2014

Cultivar	2014 Dormant Pruning wt /vine, lb	Cordon Length/Vine, ft	Avg. # Nodes Retained/Vine *	Avg. # Nodes with Live Buds/Vine *	Avg. # Shoots/Vine Pre-Thinning	Avg. # Shoots/Vine Post Thinning	Avg. # Shoots/foot Pre-thinning	Avg. # Shoots/foot Post Thinning
Albarino	3.30 cd	4.5 abc	19.8 ns	10.8 ns	20.2 bc	15.7 bc	4.5 bc	3.5 bcd
Barbera	3.34 cd	4.7 abc	19.7	13.4	29.3 cde	20.8 cdef	6.3 bcde	4.5 bcdef
Cab. franc	3.32 cd	4.8 abc	28.3	15.5	45.3 g	25.7 def	9.6 ef	5.4 defg
Cab. Sauvignon	3.90 d	5.2 c	25.6	9.7	25.8 bcd	19.8 cde	5.0 bcd	3.9 bcdef
Chambourcin	1.11 a	3.8 a	23.3	13.8	25.8 bcd	19.7 cde	7.3 cdef	5.7 fg
Chancellor	1.27 a	3.9 ab	29.0	18.3	42.0 efg	28.2 f	10.8 f	7.4 g
Gruner Veltliner	3.81 cd	4.9 bc	20.3	9.1	44.4 fg	26.8 ef	9.2 ef	5.6 efg
Lemberger	3.02 cd	4.8 abc	20.3	12.3	31.0 cdefg	20.9 cdef	6.8 bcde	4.5 bcdef
Malbec	4.05 d	4.9 bc	21.8	11.2	13.7 ab	11.8 b	3.0 ab	2.5 b
Merlot	3.74 cd	4.8 abc	20.8	10.6	33.9 cdefg	22.7 cdef	7.2 cdef	4.8 cdef
Muscat Ottonel	2.93 cd	5.1 c	22.1	12.4	32.1 cdefg	21.9 cdef	6.5 bcde	4.4 bcdef
Petit Manseng	3.18 cd	5.0 c	18.5	7.5	30.7 cdefg	21.9 cdef	6.4 bcde	4.5 bcdef
Petit Verdot	3.74 cd	4.6 abc	15.6	11.5	36.4 defg	23.7 cdef	8.5 def	5.3 cdefg
Pinot grigio	2.87 cd	4.6 abc	24.7	10.0	32.3 cdefg	22.2 cdef	7.3 cdef	5.0 cdef
Pinot noir	3.26 cd	5.2 c	22.1	10.2	30.0 cdef	22.4 cdef	5.9 bcde	4.4 bcdef
Sangiovese	3.72 cd	5.0 c	22.9	10.0	23.7 bcd	17.9 bc	4.7 bcd	3.6 bcde
Syrah	3.41 cd	4.9 bc	17.4	9.5	20.5 bc	16.1 bc	4.3 bc	3.3 bc
Tannat	3.19 cd	4.8 abc	20.7	9.8	1.3 a	1.3 a	0.3 a	0.3 a
Traminette	1.62 ab	4.6 abc	22.4	11.1	31.6 cdefg	22.2 cdef	7.2 cdef	5.1 cdef
Viognier	2.66 bc	4.8 abc	20.3	9.9	24.2 bcd	18.2 bcd	5.1 bcd	3.8 bcdef
P-Value	0.0001	0.0001	0.1989	0.3073	0.0001	0.0001	0.0001	0.0001

Letters refer to Tukey-Kramer Mean Separation, P=0.05

* Data from reps 1-3 only

Table 7. Yield data for wine grape cultivars at FREC in 2014.

Cultivar	Yield / Vine, lb.	# Clusters Harvested/Vine	# Clusters/Vine, Pre Thin	# Clusters/Vine, Post Thin	# Clusters Harvested/ft of cordon	Avg. cluster wt, g	Ravez Index 2014 Yield/2015 Pruning wt
Albarino	1.47 ab	8.4 abc	12.9 a	9.6 a	1.8 ab	70.4 a	1.00 ab
Barbera	12.02 de	19.5 cde	31.3 abcde	19.0 abcde	3.5 abc	276.5 e	5.73 b
Cab. franc	8.53 cd	24.3 de	38.5 cde	24.8 cde	4.8 bc	159.8 bc	3.20 ab
Cab. Sauvignon	2.92 ab	15.0 bcde	19.0 ab	15.1 abc	2.8 abc	90.9 ab	1.05 ab
Chambourcin	12.40 de	25.3 de	40.0 de	25.7 de	6.9 c	206.3 cd	14.51 c
Chancellor	17.93 e	44.3 f	95.2 f	44.4 f	13.4 d	161.3 bc	18.76 c
Gruner Veltliner	10.93 de	24.2 de	39.4 cde	24.3 bcde	4.9 bc	206.8 cd	4.50 ab
Lemberger	7.39 bcd	18.8 cde	28.2 abcde	19.1 abcde	4.4 abc	175.7 bc	3.45 ab
Malbec	0.95 ab	7.1 ab	9.5 a	6.6 a	1.8 ab	47.7 a	0.47 ab
Merlot	7.60 bcd	18.4 bcde	27.5 abcde	18.8 abcde	4.2 abc	184.5 bc	4.72 ab
Muscat Ottonel	6.03 abcd	15.2 bcde	26.5 abcd	19.0 abcde	4.4 abc	136.3 abc	2.74 ab
Petit Manseng	4.18 abc	21.9 de	38.1 bcde	22.1 bcde	5.2 bc	86.4 a	2.10 ab
Petit Verdot	4.25 abc	27.0 e	46.5 e	27.0 e	5.5 bc	73.6 a	1.78 ab
Pinot grigio	4.78 abc	21.9 de	34.7 abcde	23.7 bcde	4.9 bc	97.3 ab	3.04 ab
Pinot noir	3.96 abc	23.3 de	32.3 abcde	22.0 bcde	5.3 bc	74.2 a	2.50 ab
Sangiovese	8.29 cd	14.2 bcd	21.4 abc	14.6 ab	3.1 abc	255.4 de	3.28 ab
Syrah	7.64 bcd	18.6 cde	25.7 abcd	16.2 abcd	4.2 abc	170.4 bc	4.05 ab
Tannat	0.06 a	0.4 a	2.5 a	2.5 a	0.1 a	90.9 ab	0.05 a
Traminette	8.52 cd	19.9 de	30.2 abcde	21.6 bcde	4.2 abc	190.0 bc	3.29 ab
Viognier	4.99 abc	14.1 bcd	21.2 abc	15.0 abc	2.9 abc	156.3 bc	4.13 ab
P-Value	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

Letters refer to Tukey-Kramer Mean Separation, P=0.05

Table 8. Berry quality measurements at harvest of wine grape cultivars at FREC in 2014

Cultivar	pH	TA, g/L	Berry wt, g	Berries/Cluster	Fruitfulness, g/node *
Albarino	3.69 cde	7.14 cd	1.3 ab	55 ab	60 ab
Barbera	3.62 bc	8.27 defg	3.0 h	93 b	217 bc
Cab. franc	3.87 gh	5.03 a	1.9 f	83 b	127 abc
Cab. Sauvignon	3.78 efg	5.52 ab	1.6 de	56 ab	44 ab
Chambourcin	3.65 bcd	8.39 efg	2.2 fg	93 b	281 c
Chancellor	3.69 bcde	7.34 cde	2.0 fg	80 b	269 bc
Gruener Veltliner	3.96 hi	5.31 ab	2.0 fg	104 b	223 bc
Lemberger	3.90 h	6.47 bc	2.0 fg	89 b	156 abc
Malbec	3.85 fgh	7.61 cdef	2.2 fg	21 a	18 ab
Merlot	3.90 h	4.89 a	1.7 ef	107 b	202 abc
Muscat Ottonel	4.09 j	4.13 a	2.3 g	56 ab	156 abc
Petit Manseng	3.49 a	9.69 h	1.1 ab	77 b	118 abc
Petit Verdot	3.65 bcd	8.83 fgh	1.0 a	70 b	123 abc
Pinot grigio	4.04 ij	5.30 ab	1.4 bcd	72 b	97 abc
Pinot noir	3.85 gh	7.11 cd	1.3 abc	57 ab	93 abc
Sangiovese	3.74 def	5.80 ab	2.9 h	88 b	210 abc
Syrah	3.85 gh	5.80 ab	2.1 fg	77 b	234 bc
Tannat	3.39 a	14.63 i	1.7 def	53 ab	3 a
Traminette	3.57 ab	8.94 gh	1.9 f	99 b	197 abc
Viognier	4.07 j	5.19 a	1.6 cde	103 b	119 abc
P-Value	0.0001	0.0001	0.0001	0.0001	0.0001

Letters refer to Tukey-Kramer Mean Separation, P=0.05

* Data from reps 1-3 only

Winter cold Injury at FREC in 2014



Figure 1. Malbec vine (left); Syrah vine (right) with extensive winter injury. Pictures were taken on June 3, 2014.



Figure 2. Syrah vine, September 1, 2014. The vine collapsed in the middle of the summer due to cold injury in the vascular tissue of the trunk



Figure 3. Cabernet franc (July1, 2014). No winter injury.

NE1020 Vineyard established at LERGREC



Figure 4. Pinot grigio (left) and Cabernet franc vines (right) with extensive wintery injury. Photos credit B. Hed.



Figure 5. La Crescent (left) and Marquette (right) vines. Photos credit B. Hed