

**Virginia Wine Board Grant
Final Report**

6/7/2023

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Title: Evaluation of Novel Grapevine under Local Growing Condition

Proposal Number: 467444

Project Type: ☒ Research ☒ Education ☐ Marketing

Is this a multi-year grant? ☒ Yes ☐ No

If yes, which year does this report address? 1st of a 5-year grant

Original Funding Amount: 11,296.00

Remaining Balance: \$153.66

Objectives and Results:

The objective is to test wine grape varieties that are novel to Virginia and to select those better suited to our climate. The focus of the research is on vine adaptability to an increasingly variable climate and grape quality with special attention on resistance to major fungal pathogens.

The objective was partially reached due to the funding discontinuation. The original project proposal envisioned this research as a 5-year evaluation of wine grape varieties that would result in a variety recommendation publication. As of today, 1-year evaluation of the first eleven varieties planted in 2020 was completed, and all grape varieties intended for this evaluation, including the Pierce Disease resistant Peseante noir, Errante noir and Ambulo blanc, had been planted in the experimental vineyard by May 2023.

Basic evaluation included data collection as following:

- Phenology: time to budburst, bloom, veraison, and harvest, as relative to GDD accumulation.
- Vegetative characteristics, ability to slowly/rapidly fill the trellis.
- Reproductive disorders (e.g., bud necrosis, bunch stem necrosis).
- Noteworthy nutrient deficiencies, disease or pest problems.
- Components of yield: cluster and berry weight, yield per vine.
- Primary fruit chemistry
- Vine size (pruning weights).
- Dormant bud cold hardiness (Nov, Jan and late-Feb).

One-year observations and the results can be found in the Appendix of this document.

Overall Benefit for Virginia Wine Industry:

Data compiled during one year can be used as a baseline for selection and adoption of varieties resistant to downy and powdery mildew. Moreover, some of the varieties that showed the resistance to these diseases have been already used as a pollen donor or as a mother vine in the grape breeding project led by Dr. Sapkota, which goal was to create disease resistant varieties for VA.

Adopting and growing varieties that are resistant to vine pathogens would reduce the need for frequent fungicide sprays and decrease the labor input into canopy management. This aspect is very important considering that 2 of 3 producers see the lack of workforce as a key challenge facing the industry over the near future. Reduced number of sprays per season, would lower the production costs that has also been identified as the biggest challenge in the coming years by every third grape growers.

Sustainable food production is also essential for the conservation of natural resources. The beneficial effect on the environment with reduced diesel use and smaller amount of drifted chemicals that stay in the soil or reach groundwater should not be overlooked. Additionally, less frequent use of chemicals would leave minor chemical residue on the fruit, which might in turn reduce workers' exposure to toxicity and improve consumer safety.

Likewise, selection of cultivars with improved tolerance of disease pressures and intermittent heavy rainfalls increases profitability on the wine production side due to reduction of time spent in cluster sorting, and decreased yield loss caused by berry splitting and compromised fruit. Moreover, this will lead to reduced costs for remediation during the winemaking process (e.g. treatment of volatile acidity, fining agents), and holistically supports the growing interest in less-invasive winemaking techniques.

Publications and Activities Associated with Project:

Publications:

- Virginia Cooperative Extension. **Viticulture Notes** (January 27, 2022), prepared by T. Wolf.
- Virginia Tech Enology Extension. **Sentinel Vineyards: "State of the Grape in the State" Report 1** (August 19, 2022), prepared by M. Nita, B. Chang, T. Hatch, and D. Acimovic. Novel Varieties Trial Summary.
- Virginia Tech Enology Extension. **Sentinel Vineyards: "State of the Grape in the State" Report 2** (September 02, 2022), prepared by M. Nita, B. Chang, T. Hatch, and D. Acimovic. Novel Varieties project: basic fruit chemistry.

Events:

- **46th ASEV-Eastern Section Annual Meeting**, Bloomington, Minnesota (July 13-15, 2022). Industry Workshop: Resiliency in Grape and Wine Production, Section Viticulture. Presented by C. Hickey, Penn State and M. Smith, Ohio State University.
- **2022 Chemical Evaluation Field Day**, Virginia Tech, AHS Jr. AREC, Winchester (September 15, 2022). Evaluation of Novel Grapevine under Local Growing Condition and Virginia Resistant Varieties, presented by D. Acimovic.
- **2023 VVA Winter Technical Meeting**, Charlottesville, Virginia (February 16, 2023). Novel Varieties Trial 2022 Recap, presented by D. Acimovic.

Future Work:

For now, Virginia Tech Viticulture and Grape Pathology labs will continue to provide basic vineyard maintenance to the variety trail. In the recent future and with a new viticulturist onboard, we will attempt to obtain continuous funding for data collection and sample analysis pertaining to this project.

Final Budget and Justification:

Item Type	Original Awarded Amount	Final Amount Spent
Personnel	\$6,840.00	\$4813.50
Fringe	\$560.00	\$367.75
Travel	\$0.00	\$0.00
Supplies & Materials	\$3,896.00	\$6,040.23
Contractual	\$0.00	\$0.00
Other	\$0.00	\$0.00
Total	\$11,296.00	\$11,221.48

The remaining balance of the project is \$153.66. We spent \$2,026.5 less on Personnel and \$192.25 less on Fringe. However, we spent \$2,144.23 more on Supplies & Materials than anticipated with the original budget.

References: [List all references.]

APPENDIX

Table 1. Canopy health status during the season of 2022.

Variety/clone	Mid-season observations (July 12-19)		Harvest and post-harvest observations
	Nutrient deficiencies	Disease problems	Disease problems
Chardonel 01.1	NA	NA	NA
Fleurtaí 01	Interveinal chlorosis sporadically present on all basal leaves, possible Mg-deficiency.		
Gamaret	NA	NA	DM on young leaves. After harvest, shoot tops noticeably defoliated.
Garanoir		Sporadic purple mosaic on old leaves, possible Red blotch virus.	DM present on young leaves. After harvest shoot tops significantly defoliated.
Itasca	Interveinal chlorosis present on all basal leaves, possible Mg-deficiency		
Marselan 980	NA	NA	NA
Petra (SK-77-5-3)	Interveinal chlorosis present in many basal leaves – possible frost damage or Mg-deficiency.		Sporadic DM and Black rot on young leaves.
San Marco (ECO-1)		Minor Phomopsis.	DM present on young leaves. Tops moderately defoliated. post-harvest.
Saperavi 04.1		Minor Phomopsis.	Sporadic PM on rachis, and DM on young leaves. Tops moderately defoliated.
Soreli 01.1	Interveinal chlorosis sporadically present on all basal leaves, possible Mg-deficiency.		
Teroldego 05.10.1			DM present on young leaves. Later, shoot tops moderately defoliated.
Verdejo 01.10.1		Minor Black rot.	DM on young leaves. After harvest, shoot tops severely defoliated.

NA indicates that data was not collected because the vines were planted in 2021.

DM – Downy Mildew; PM – Powdery Mildew

Varieties were grafted to 101-14, except Verdejo that was grafted to C-3309. Vines are trained to VSP; spacing is 4' x 8'.

Table 2. *Phenology stages in 2022*

Variety/clone	10% Bud break	75% Bud break	10% Bloom	75% Bloom	Veraison	Harvest
Chardonel 01.1	24-Apr	28-Apr	31-May	6-Jun	1-Aug	NA
Fleurtaï 01	8-Apr	14-Apr	30-May	1-Jun	15-Jul	14-Sep
Gamaret	15-Apr	22-Apr	31-May	1-Jun	27-Jul	15-Sep
Garanoir	11-Apr	20-Apr	31-May	1-Jun	20-Jul	22-Sep
Itasca	16-Apr	22-Apr	24-May	27-May	12-Jul	6-Sep
Marselan 980	22-Apr	29-Apr	2-Jun	5-Jun	4-Aug	NA
Petra (SK-77-5-3)	4-Apr	13-Apr	28-May	30-May	27-Jul	14-Sep
San Marco (ECO-1)	14-Apr	18-Apr	2-Jun	6-Jun	11-Aug	22-Sep
Saperavi 04.1	13-Apr	16-Apr	2-Jun	5-Jun	11-Aug	22-Sep
Soreli 01.1	16-Apr	22-Apr	31-May	4-Jun	25-Jul	14-Sep
Teroldego 05.10.1	16-Apr	22-Apr	1-Jun	6-Jun	4-Aug	22-Sep
Verdejo 01.10.1	16-Apr	22-Apr	31-May	4-Jun	4-Aug	15-Sep

NA indicates that data was not collected because the vines were planted in 2021.

Varieties were grafted to 101-14, except Verdejo that was grafted to C-3309. Vines are trained to VSP; spacing is 4' x 8'.

Table 3. *Reproductive disorders and vegetative characteristics.*

Variety/clone	Fruit Set	Bunch Stem Necrosis (%)	Vegetative characteristics on July 1-19
Chardonel 01.1	NA	NA	NA
Fleurtaï 01	Shot berries.	1.3	Vigorous, rapidly fill the trellis with many short laterals.
Gamaret		46.6	Medium vigor.
Garanoir	Some vines with poor fruit set, shot berries.	0.0	Week, slowly fill the trellis.
Itasca		15.4	Vigorous, rapidly fill the trellis, no lateral growth.
Marselan 980	NA	NA	NA
Petra (SK-77-5-3)	Some clusters behind in development with shot berries.	0.0	Vigorous, rapidly fill the trellis with many laterals.
San Marco (ECO-1)		51.3	Vigorous, rapidly fill the trellis with many laterals.
Saperavi 04.1		34.1	Very vigorous, rapidly fill the trellis with many laterals.
Soreli 01.1	Some vines with poor fruit set.	6.4	Very vigorous, rapidly fill the trellis, laterals more on the top of canopy.
Teroldego 05.10.1	Some vines with poor fruit set.	7.5	Vigorous, rapidly fill the trellis with many laterals.
Verdejo 01.10.1	Poor fruit set, shot berries.	3.8	Medium vigor, many laterals.

NA indicates that data was not collected because the vines were planted in 2021.

Bunch Stem Necrosis was rated on 20 clusters per panel at harvest.

Varieties were grafted to 101-14, except Verdejo that was grafted to C-3309. Vines are trained to VSP; spacing is 4' x 8'.

Table 4. Disease rating at harvest, 2022.

Variety/clone	Black Rot		Phomopsis		Sour Rot	
	Incidence (%)	Severity (%)	Incidence (%)	Severity (%)	Incidence (%)	Severity (%)
Chardonel 01.1	NA		NA		NA	
Fleurtaï 01	26.5	2.2	1.3	1.0	30.1	7.3
Gamaret	7.7	3.4	0.0		1.3	1.0
Garanoir	20.0	3.4	0.0		52.5	14.8
Itasca	57.1	2.1	0.0		0.0	
Marselan 980	NA		NA		NA	
Petra (SK-77-5-3)	15.0	1.5	1.3	5.0	6.3	3.2
San Marco (ECO-1)	0.0		0.0		23.8	7.0
Saperavi 04.1	0.0		0.0		96.2	31.6
Soreli 01.1	13.9	3.7	13.9	3.8	72.2	22.1
Teroldego 05.10.1	0.0		0.0		96.3	49.5
Verdejo 01.10.1	5.0	4.7	3.8	1.0	17.5	5.7

NA indicates that data was not collected because the vines were planted in 2021.

Rating was done on 20 clusters per panel at harvest.

Varieties were grafted to 101-14, except Verdejo that was grafted to C-3309. Vines are trained to VSP; spacing is 4' x 8'.

Powdery mildew, Botrytis bunch rot, Bitter rot, and Ripe rot on clusters were not noticed.

Table 5. Harvest parameters

Variety/clone	Vine pruned to	Cluster #/vine	Crop Weight (lbs./vine)	Cluster Weight (lbs.)	Berry # /Cluster	Berry Weight (g.)	Tons/acre equivalent	Pruning Weight (lbs./vine)	Ravaz Index
Chardonel 01.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fleurtaï 01	2 canes	34.1	9.3	0.28	78.8	1.61	6.3	1.13	8.9
Gamaret	1 cane	36.8	4.8	0.13	40.8	1.38	3.2	0.25	26.8
Garanoir	1 cane	28.2	7.8	0.28	67.9	1.86	5.3	0.28	33.6
Itasca	2 canes	32.4	6.0	0.18	64.1	1.30	4.1	0.93	6.8
Marselan 980	NA	NA	NA	NA	NA	NA	NA	NA	NA
Petra (SK-77-5-3)	2 canes	17.2	5.9	0.35	119.4	1.35	4.0	1.01	6.4
San Marco (ECO-1)	2 canes	28.4	11.3	0.41	88.9	2.09	7.7	0.62	19.8
Saperavi 04.1	2 canes	24.6	11.7	0.48	92.4	2.35	8.0	0.91	14.3
Soreli 01.1	2 canes	30.2	12.2	0.41	123.6	1.49	8.3	1.00	13.5
Teroldego 05.10.1	1 cane	12.9	3.9	0.33	66.2	2.27	2.7	0.42	12.1
Verdejo 01.10.1	2 canes	35.6	13.8	0.39	71.3	2.51	9.4	0.94	15.3

NA indicates that data was not collected because the vines were planted in 2021.

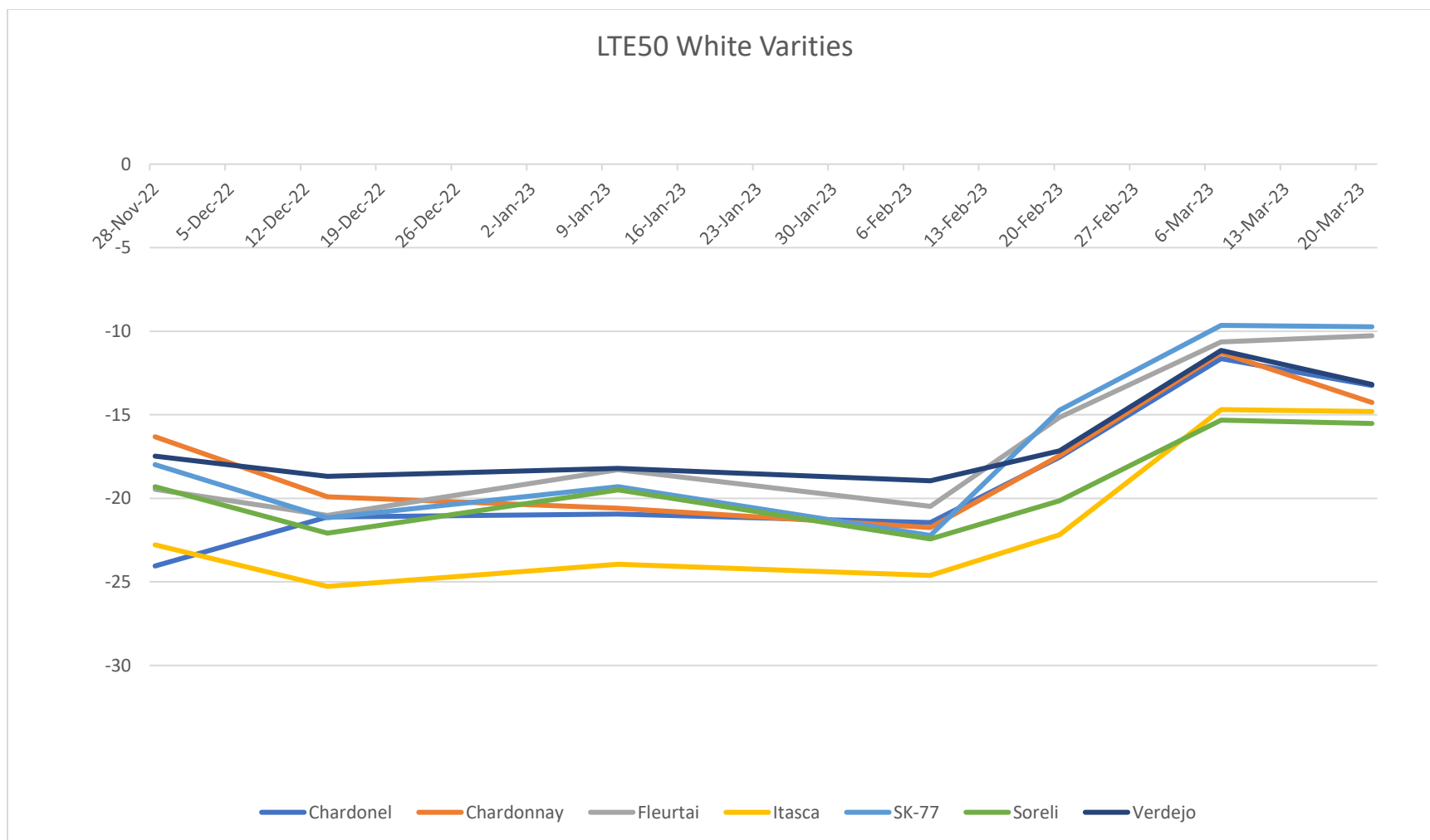
Varieties were grafted to 101-14, except Verdejo that was grafted to C-3309. Vines are trained to VSP; spacing is 4' x 8'.

Table 6. *Fruit chemistry at harvest*

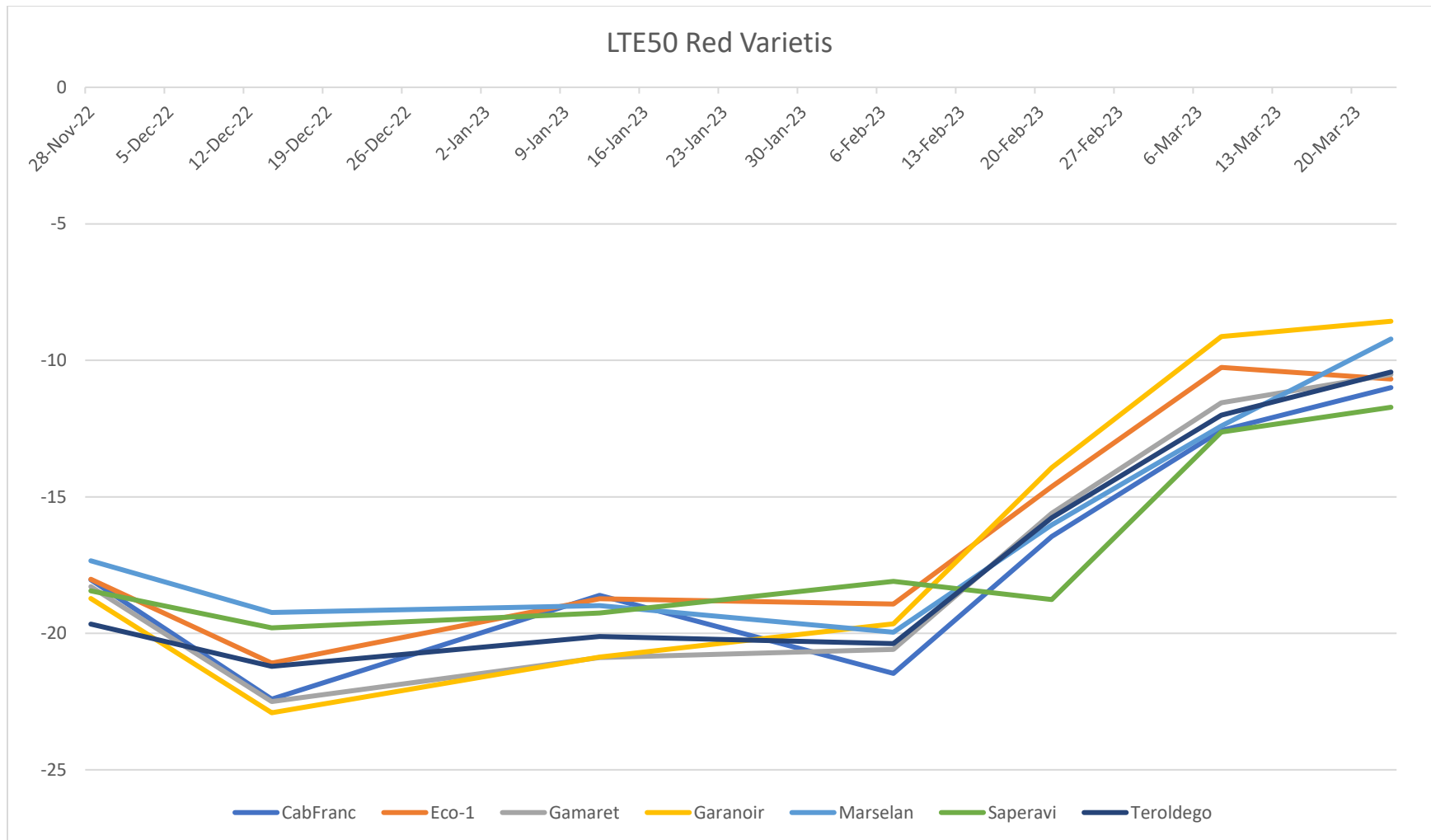
Variety/clone	°Brix	pH	TA (g./L)
Chardonnay 01.1	NA	NA	NA
Fleurtaï 01	20.0	3.87	2.58
Gamaret	21.4	3.67	3.33
Garanoir	18.7	3.76	3.25
Itasca	24.2	3.93	5.61
Marselan 980	NA	NA	NA
Petra (SK-77-5-3)	23.1	3.72	3.35
San Marco (ECO-1)	17.9	3.47	6.10
Saperavi 04.1	17.0	3.40	7.15
Soreli 01.1	19.4	3.69	3.78
Teroldego 05.10.1	20.4	3.62	5.15
Verdejo 01.10.1	17.8	3.60	4.87

NA indicates that data was not collected because the vines were planted in 2021.

Varieties were grafted to 101-14, except Verdejo that was grafted to C-3309. Vines are trained to VSP; spacing is 4' x 8'.



Graph 1. Low thermal exotherms that indicate lethal temperatures for 50% of white varieties' buds collected November 2022 - March 2023.



Graph 2. Low thermal exotherms that indicate lethal temperatures for 50% of red varieties' buds collected November 2022 - March 2023.