

Supplemental Data for:

Scharfetter J, Nelson A, Workmaster BA and Atucha A. 2020.

Evaluation of ripening indicators for harvest-time decision making in cold climate grape production.

Am J Enol Vitic 71:319-333. doi: 10.5344/ajev.2020.20022.

Supplemental Table 1 Date of harvest and cumulative growing degree days (GDD; base temperature 10°C with an upper limit of 30°C) from 1 April until the date of harvest, harvest yield (kg/vine), and winter pruning weights (kg/vine; means ± SEM) in the 2017 and 2018 seasons for the grape cluster microclimate treatments (shaded and exposed) in the cold climate interspecific hybrid grape cultivars Brianna, Frontenac, La Crescent, Léon Millot, Maréchal Foch, Marquette, MN 1220, and Petite Pearl grown at the West Madison Agricultural Research Station in Verona, WI.

Cultivar	Dates harvested	GDD	Yield (kg/vine)			Pruning weight (kg/vine)			Ravaz index (kg fruit/kg prunings)
			Treatment		p value ^a	Treatment		p value ^a	
			Shaded	Exposed		Shaded	Exposed		
Brianna	5 Sept 2017	1223	6.2 ± 0.6	4.0 ± 0.5	0.056	2.6 ± 0.2	2.5 ± 0.1	0.631	2.0
	23 Aug 2018	1248	7.9 ± 0.9	8.1 ± 0.5	0.833	2.2 ± 0.1	2.0 ± 0.1	0.490	3.8
Frontenac	27 Sept 2017	1436	8.4 ± 0.3	7.7 ± 1.1	0.576	2.1 ± 0.3	2.1 ± 0.2	0.442	3.8
	17 Sept 2018	1502	9.7 ± 0.6	8.4 ± 0.4	0.125	1.1 ± 0.1	1.0 ± 0.1	0.846	8.6
La Crescent	20 Sept 2017	1340	8.2 ± 0.5	6.2 ± 0.5	0.097	1.9 ± 0.4	1.4 ± 0.1	0.420	4.4
	30 Aug 2018	1326	5.3 ± 1.2	6.0 ± 0.5	0.229	2.1 ± 0.4	1.3 ± 0.1	0.288	3.3
Léon Millot	22 Sept 2017	1367	5.6 ± 0.6	4.1 ± 0.6	0.135	2.4 ± 0.1	2.1 ± 0.1	0.053	2.2
Maréchal Foch	18 Sept 2017	1322	5.3 ± 0.6	5.9 ± 0.6	0.477	1.6 ± 0.3	1.2 ± 0.4	0.484	4.0
Marquette	25 Sept 2017	1412	2.0 ± 0.4	1.9 ± 0.2	0.720	2.7 ± 0.3	3.0 ± 0.1	0.495	0.7
	4 Sept 2018	1383	3.5 ± 0.5	3.0 ± 0.1	0.384	1.5 ± 0.1	1.4 ± 0.2	0.501	2.2
MN 1220	18 Sept 2017	1322	9.6 ± 0.4	8.3 ± 0.8	0.225	2.3 ± 0.2	2.3 ± 0.1	0.819	3.9
Petite Pearl	27 Sept 2017	1436	7.9 ± 0.8	10.2 ± 0.6	0.059	1.3 ± 0.2	1.1 ± 0.2	0.252	7.5
	17 Sept 2018	1502	6.6 ± 0.8	6.6 ± 0.6	0.966	1.2 ± 0.1	1.3 ± 0.1	0.342	5.3

^aWelch *t*-tests were used to generate *p* values between the shaded and exposed treatments.

Supplemental Table 2 *P* value matrix for linear regression comparisons across treatments and years among each tested grape berry indicator for the grape cluster microclimate treatments (shaded and exposed) in the white cold climate interspecific grape cultivars Brianna, La Crescent, and MN 1220 grown at the West Madison Agricultural Research Station in Verona, WI during the 2017 and 2018 seasons. TA, titratable acidity.

Berry indicator	<i>P</i> value	Cultivar		
		Brianna	La Crescent	MN 1220 ^a
Berry fresh weight	Year	0.390	0.010 ^{ab}	–
	Treatment	0.985	0.897	0.256
	Treatment x Year	0.762	0.954	–
Brix	Year	0.012	0.676	–
	Treatment	0.430	0.849	0.841
	Treatment x Year	0.886	0.776	–
TA (g/L tartaric acid equiv)	Year	0.034	0.407	–
	Treatment	0.237	0.343	0.260
	Treatment x Year	0.912	0.937	–
pH	Year	0.000*	0.000*	–
	Treatment	0.454	0.151	0.382
	Treatment x Year	0.558	0.883	–
Total phenolics (mg/L gallic acid equiv)	Year	0.006*	0.009*	–
	Treatment	0.161	0.979	0.119
	Treatment x Year	0.231	0.310	–
Total protein (mg/L BSA equiv)	Year	0.000*	0.022	–
	Treatment	0.234	0.219	0.355
	Treatment x Year	0.105	0.694	–
Total tannin (mg/L (-) epicatechin equiv)	Year	0.000*	0.000*	–
	Treatment	0.001*	0.182	0.003*
	Treatment x Year	0.005*	0.389	–

^aMN 1220 was evaluated in the 2017 season only.

^b* indicates significance at $\alpha = 0.01$.

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Supplemental Table 3 *P* value matrix for linear regression comparisons across treatments and years among each tested grape berry indicator for the grape cluster microclimate treatments (shaded or exposed) in the red cold climate interspecific grape cultivars Frontenac, Léon Millot, Maréchal Foch, Marquette, and Petite Pearl grown at the West Madison Agricultural Research Station in Verona, WI during the 2017 and 2018 seasons. TA, titratable acidity.

Berry Indicator	<i>P</i> value	Cultivar				
		Frontenac	Léon Millot ^a	Maréchal Foch ^a	Marquette	Petite Pearl
Berry fresh weight	Year	0.076	–	–	0.346	0.039
	Treatment	0.848	0.603	0.279	0.789	0.849
	Treatment x Year	0.708	–	–	0.791	0.927
Brix	Year	0.001 ^b	–	–	0.189	0.022
	Treatment	0.304	0.786	0.289	0.766	0.228
	Treatment x Year	0.832	–	–	0.400	0.963
TA (g/L tartaric acid equiv)	Year	0.006 [*]	–	–	0.578	0.001 [*]
	Treatment	0.236	0.437	0.040	0.463	0.013
	Treatment x Year	0.625	–	–	0.823	0.189
pH	Year	0.000 [*]	–	–	0.000 [*]	0.000 [*]
	Treatment	0.118	0.298	0.042	0.587	0.670
	Treatment x Year	0.914	–	–	0.155	0.685
Total phenolics (mg/L gallic acid equiv)	Year	0.004 [*]	–	–	0.865	0.962
	Treatment	0.003 [*]	0.462	0.028	0.011	0.000 [*]
	Treatment x Year	0.685	–	–	0.215	0.062
Monomeric anthocyanins (mg/L Mv-3-glc equiv)	Year	0.000 [*]	–	–	0.000 [*]	0.000 [*]
	Treatment	0.061	0.893	0.001 [*]	0.254	0.249
	Treatment x Year	0.508	–	–	0.533	0.019
Percent polymeric color	Year	0.618	–	–	0.011	0.351
	Treatment	0.429	0.639	0.138	0.225	0.166
	Treatment x Year	0.489	–	–	0.430	0.266
Total protein (mg/L BSA equiv)	Year	0.000 [*]	–	–	0.750	0.004 [*]
	Treatment	0.769	0.920	0.300	0.179	0.786
	Treatment x Year	0.953	–	–	0.601	0.887
Total tannin (mg/L (-) epicatechin equiv)	Year	0.000 [*]	–	–	0.000 [*]	0.000 [*]
	Treatment	0.000 [*]	0.417	0.542	0.000 [*]	0.000 [*]
	Treatment x Year	0.312	–	–	0.345	0.735

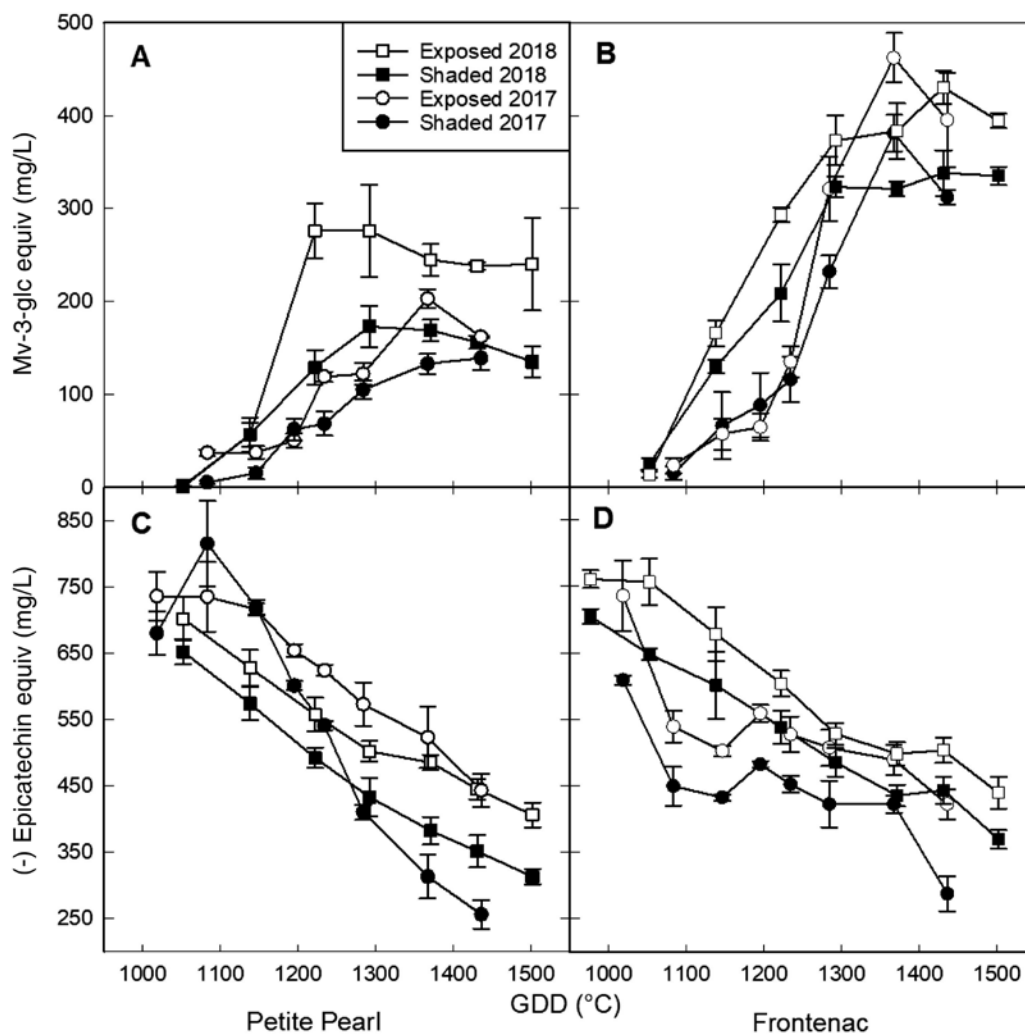
^aLéon Millot and Maréchal Foch were evaluated in the 2017 season only.^b* indicates significance at $\alpha = 0.0$

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Supplemental Figure 1 Monomeric anthocyanin (mg/L Mv-3-glc equiv) and tannin (mg/L (-) epicatechin equiv) concentrations (means \pm SEM) across cumulative growing degree days (GDD, base temperature 10°C with an upper limit of 30°C) for the red cold climate interspecific hybrid grape cultivars Petite Pearl (A and C) and Frontenac (B and D) within two different grape cluster microclimate treatments (exposed or shaded) for the 2017 and 2018 seasons.