Relative susceptibility of cold-hardy winegrape cultivars to powdery mildew in Vermont, USA

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Winegrapes are a new crop in the diversification of agriculture in cold climates such as in Vermont. In the past, commercial winegrape production was not recommended in the colder regions of northeastern USA because of problems with winter survival of the vines. However, 'new' winegrape interspecific hybrids such as 'Frontenac', 'St. Croix', and 'La Crescent' which have been reported to survive -34^{0}C to -37^{0}C temperatures are being planted on newly created farms or as an alternative crop on existing farms.

These cold-hardy winegrapes were developed by the University of Minnesota (MN) or by a private breeder, Elmer Swenson, in Wisconsin. In addition to cold-hardiness, these hybrids were bred for disease resistance. The purpose of this research was to examine the relative susceptibility of the MN and Swenson winegrape hybrids to powdery mildew, *Uncinula necator*. For comparison, a French-American hybrid and a *Vitis vinifera* cultivar were included in this study in one of the vineyards.

The research was conducted in two commercial vineyards in the Champlain Valley of Vermont during the 2004 and 2005 growing seasons. In one of the vineyards, Vineyard 1, no fungicides were applied in either year so that the full potential of disease susceptibility could be evaluated. In the other vineyard, Vineyard 2, fungicide applications were minimal: three fungicide sprays in 2004 (i.e., sulfur, myclobutanil, or kresoxim-methyl) and four sprays in 2005 (myclobutanil or kresoxim-methyl) applied to all grape vines.

On 3 Sept 2004 and on 9 Sept 2005, 25 leaves were randomly selected from 3-vine plots arranged in a completely randomized design with 4 replications. Leaves were placed in plastic bags and transported to the laboratory in cooled containers where they were refrigerated until foliar disease incidence and severity were rated. Disease severity (area infected) was rated using the Horsfall-Barrett scale and converted to percentages using the Elanco conversion tables. Data were transformed using the arcsin sqrt transformation before statistical analysis. Results are presented in Tables 1 and 2.

It appeared that weather conditions were more favorable for powdery mildew development in 2004 than in 2005. In each year, there were significant differences between cultivars in both incidence and severity in Vineyard 1 (Table 1). In 2004, 'Riesling', the only *V. vinifera* winegrape in the study, had significantly higher incidence and severity than the French-American hybrid 'Leon Millot' and the MN and Swenson hybrids. 'St. Croix' had the lowest level of powdery mildew. In 2005, the 'Riesling' vines did not survive the winter and data were only collected on the other three cultivars of which 'Leon Millot' had significantly more powdery mildew than the MN and Swenson hybrids.

In Vineyard 2, 'St. Croix' also had significantly lower incidence and severity than 'Frontenac' in 2004 (Table 2). However, 'La Crescent' had the lowest ratings (i.e., 0%). Mildew ratings on 'Prairie Star' were not significantly different from 'La Crescent' or 'St. Croix'. In 2005, no mildew was observed on any of the cultivars.

This research documents differences in susceptibility of some of the 'newer' cold-hardy interspecific hybrids to powdery mildew. Additional data were also collected on the relative susceptibility of these hybrids to other major grape diseases (Berkett et al., 2005). This information will be used to develop cold climate winegrape disease management programs focused on incorporating the intrinsic disease resistance of the hybrids as a way to reduce the use of unnecessary fungicides in this emerging crop in Vermont.

References:

Berkett, L.P., Garcia, M.E., Eddy, M.E., Kingsley-Richards, S.L., and T.L. Bradshaw. 2005. Evaluation of disease susceptibility of two 'new' cold-hardy wine grapes. Biological and Cultural Tests for Control of Plant Disease. Vol. 20: N002. http://www.plantmanagementnetwork.org/pub/trial/bctests/Vol20/

Table 1. Foliar incidence and severity of powdery mildew, Vineyard 1.

	2004*		**2005***	
Cultivar **	% Incidence	% Area infected	% Incidence	% Area infected
Frontenac	66.0 b	30.40 b	0.0 b	0.0 b
Leon Millot	79.0 b	41.34 b	48.0 a	9.93 a
Riesling	100.0 a	90.42 a	--	--
St. Croix	27.0 c	2.16 c	0.0 b	0.0 b

* Means followed by the same letters within columns are not significantly different according to Tukey's Studentized Range (HSD) Test ($P \leq 0.05$).
**Cultivars were non-sprayed in both years

Table 2. Foliar incidence and severity of powdery mildew, Vineyard 2.

	2004*		**2005***	
Cultivar **	% Incidence	% Area infected	% Incidence	% Area infected
Frontenac	40.0 a	2.88 a	0.0 a	0.0 a
La Crescent	0.0 c	0.00 b	0.0 a	0.0 a
Prairie Star	7.0 bc	0.21 b	0.0 a	0.0 a
St. Croix	15.0 b	0.35 b	0.0 a	0.0 a

* Means followed by the same letters within columns are not significantly different according to Tukey's Studentized Range (HSD) Test ($P \leq 0.05$).
**Cultivars received three fungicide applications in 2004, four applications in 2005.

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