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Evaluation and utilization of *Vitis riparia* as a source of genes for extreme cold hardiness

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Abstract: The goal of the University of Minnesota grape breeding program is to develop high quality wine and table cultivars that tolerate winter temperatures as low as -35 °C and ripen in a relatively cool, short growing season. Northern clones of *Vitis riparia* have been collected, evaluated and used in the breeding program. Genotypes of *V. riparia* from the northern portion of the species range experience winter temperatures of -40 °C or lower. In addition to extreme cold hardiness, these genotypes also exhibit early ripening, high sugar levels, and resistance to powdery mildew and phylloxera. Deleterious traits of many *V. riparia* clones include high acidity, small cluster and berry size, very dark juice, strong characteristic flavor, and excessive vegetative growth.

Over 100 *V. riparia* clones have been selected and evaluated in Minnesota over the past decade. These clones exhibit substantial variability for the viticultural traits mentioned above. For example, sugar levels typically range from 23 to 28 °Brix; titratable acidity ranges from under 2% to over 4%; juice color varies from very dark purple to light red; time of leaf senescence can vary by 2 to 3 weeks. Controlled environment studies indicate that early acclimation in these northern clones is photoperiod-induced.

Superior clones crossed with *V. vinifera* and interspecific hybrid cultivars produced selections in the F₁ and subsequent generations that were viticulturally and enologically acceptable.

Some of these selections have suffered minimal injury after experiencing midwinter temperatures as low as -35 °C, both in the vineyard and in laboratory freezing studies.