



Viticulture, enology and marketing for cold-hardy grapes



Characterizing Anthocyanins in Red Cold Hardy Hybrids

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Background and Rationale: Traditional red *V. vinifera* wine grapes are unusual among *Vitis* species in that their color is provided almost entirely by monoglucoside anthocyanins. All other known non-*vinifera* grapes contain both mono- and diglucoside anthocyanins, and often more of the latter. Because the structure of diglucoside anthocyanins make them less capable of binding in molecules that stabilize color, wines made from interspecific hybrids with higher levels of diglucoside anthocyanins are more likely to have unstable color in atypical hues. While extensive research has been performed on *V. vinifera* monoglucosides, little is known about typical anthocyanin types and quantities in interspecific cold-hardy red hybrid grapes.

Treatments: In a preliminary effort to characterize varietal and annual variation in anthocyanins, 100 berry samples of four cold-hardy hybrids (Frontenac, Marquette, St. Croix, MN1200) were taken from fruit harvested in four vineyards (CTSAES, Willsboro, Black Diamond Farms and the Cornell teaching vineyard in Geneva, NY) in September of 2014 and 2015. Thirteen samples were available in 2014, but due to weather issues, only 5 were harvested in 2015.

Methods: Berry samples were hand-crushed in plastic bags, and juice was strained through cheesecloth, then stored frozen. Prior to analysis, all samples underwent solid phase extraction (SPE). Anthocyanins were eluted, concentrated to dryness, resuspended in 1 ml of 0.1 N HCl and filtered prior to analysis. High performance liquid chromatography (HPLC) was performed on an Agilent 1260 Infinity series HPLC (Agilent Technologies, Santa Clara, CA, USA) equipped with a 100 mm x 2.1 mm pentafluorophenyl (PFP) column packed with 2.6 μm diameter particles with a 100 \AA pore size. Samples were analyzed using the method reported in Manns and Mansfield (2012). Anthocyanin monoglucosides and modified anthocyanins were quantified as malvidin 3-glucoside equivalents, and anthocyanin diglucosides as malvidin 3,5-diglucoside equivalents.

Results: As expected from empirical observation of color, all cultivars had higher concentrations of diglucoside than monoglucoside anthocyanins (Figure 1). Ratios varied by cultivar; Marquette samples were found to have diglucoside concentrations 2 to 9 times higher than monoglucosides, while Frontenac and St. Croix had 10 to 20 times more diglucosides. It's interesting to note that Frontenac grapes generally had higher concentrations of total glucosides than Marquette. Differences based on year or vineyard location were not observed. A detailed quantification of individual anthocyanin types is underway.

What the results mean:

- High levels of diglucosides in cold-hardy hybrid grapes will result in wine color and aging that differs from that observed in traditional *V. vinifera* wine grape cultivars.

- The high concentration of anthocyanins found in Frontenac is a likely cause of the dark color found in red Frontenac wines.

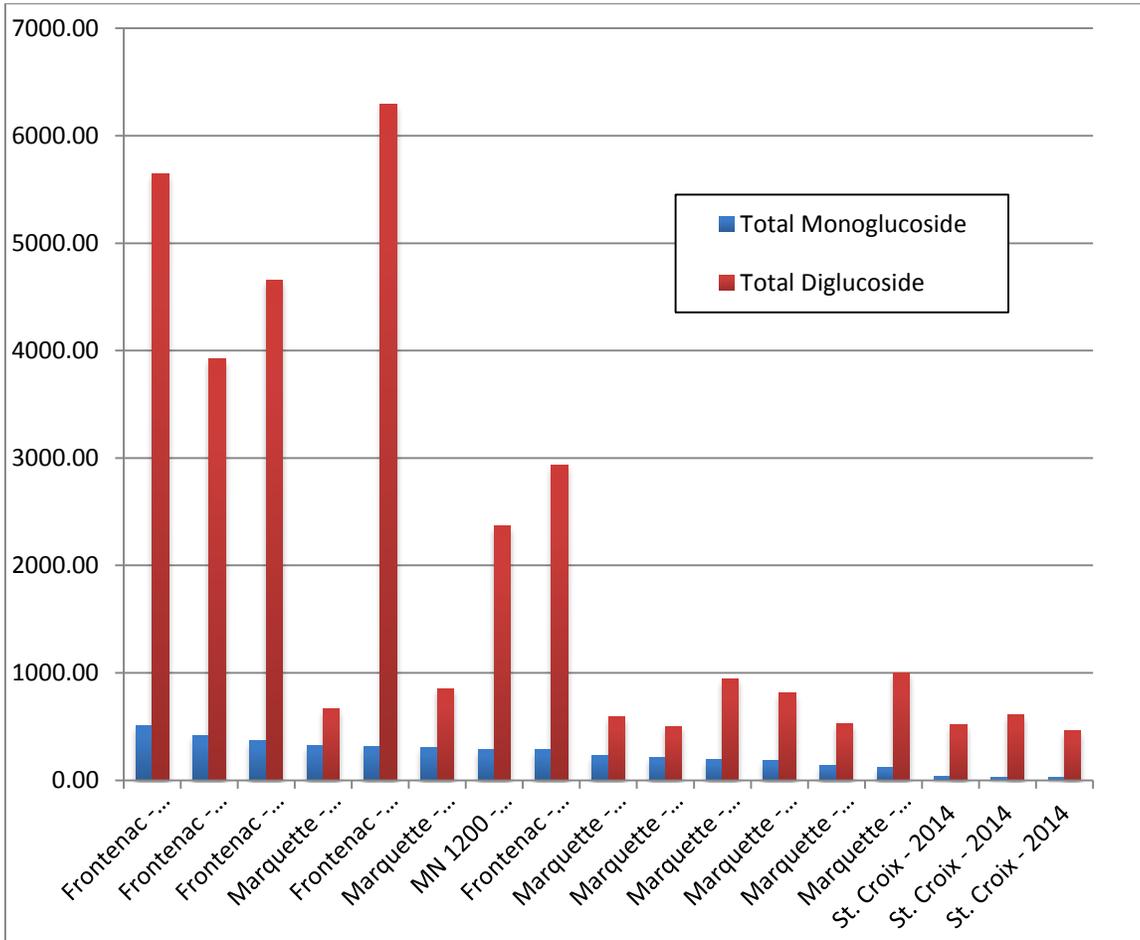


Figure 1: Total mono- and diglucosides in berry samples of cold-hardy winegrape cultivars, 2014-2015.