



Viticulture, enology and marketing for cold-hardy grapes



Frontenac gris and Brianna Berry Ripening

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Background and Rationale: The ripening process and chemical and molecular character of many of the European cultivars are well described; however, these characteristics are not well described for the emerging cold climate cultivars. The cold climate cultivars Frontenac Gris and Brianna are complex hybrids that combine characters of the European wine grape (*V. vinifera*) and North American *Vitis* species. Frontenac Gris (2003) was identified as a single bud mutation of Frontenac. Brianna was originally bred and selected as a table grape by Elmer Swenson and named in 2002. The objective of this study was to characterize the berry ripening processes in Frontenac Gris and Brianna at the gene and chemical level, providing baseline information that may be used in combination with traditional Brix, pH and TA measures for identifying biomarkers for signature varietal characters and optimal ripeness.

Treatments:

- Frontenac Gris berry sampling targets were veraison and 20, 22 and 24°Brix.
- Brianna berry sampling targets were veraison and 16, 18 and 20°Brix.
- Wine made from Frontenac Gris at 20, 22 and 24°Brix (2 batches at each Brix point). At each Brix target date the juice was brought to 24 °Brix with the addition of sugar so that all wines would have similar alcohol content after fermentation.
- Wine made from Brianna at 16, 18, 20 °Brix (2 batches at each Brix point). At each Brix target the juice was brought to 20°Brix with the addition of sugar so that all wines would have similar alcohol content after fermentation.
- Frontenac, Marquette, La Crescent and St. Croix and Brianna and Frontenac Gris berries sampled from the NE1020 planting for volatiles from veraison to harvest at weekly intervals.

Methods:

- Frontenac Gris and Brianna transcriptome, metabolome and sensory analysis. In 2015 berries were collected from Tuckers Walk and NE1020 replicated trial at 5 timepoints from veraison to harvest. Four replicates were collected at each time point and pH, Brix and TA measured. RNA was extracted from all samples.
 - Transcriptome analysis is currently being conducted was conducted using RNA sequencing (RNASeq) and comparisons of skin and pulp will be conducted to identify differentially expressed genes to provide skin and pulp characters in berries at harvest.
 - Wine was made using UMN standard protocol at Tuckers Walk Winery, Garretson, SD.

- Skin and pulp samples will be provided to UMN for metabolite analysis (Hegeman lab). Whole berries were provided for sensory analysis (Vickers lab).
- Four replicates of berries volatiles were collected at 5 timepoints for Frontenac Gris and Brianna at Tuckers Walk, Garretson, SD. Frontenac, Marquette, La Crescent and St. Croix were also collected from NE1020 Plots at NE Hansen Research Center in Brookings, SD. Berries were transferred to Somchai Rice at Iowa State University for analysis.

Results: The Marquette and Frontenac studies in the first two years of the Northern Grapes project indicated that additional timepoints would be valuable for analysis of the white wine grapes. Therefore the protocol for the berry ripening analysis was modified to provide greater ripening coverage for the sensory analysis studies. The extreme temperatures in January and November 2014 resulted in severe winter injury in La Crescent. La Crescent was replaced with Brianna for the ripening study. Tuckers Walk Vineyard and Winery were used to for Brianna and Frontenac Gris berry sampling and wine production.

- Berry development was monitored from veraison to harvest for pH, Brix and TA. The 2015 season was cool and ripening was delayed. Veraison occurred August 28 for Brianna and September 11 for Frontenac Gris. Both cultivars were sampled weekly through final harvest.
- Brianna was sampled for wine weekly from September 4 to September 25, 2015. Four sample dates and wines were made for Brianna as the first harvest on September 4 was below 16°Brix. The berry pH ranged from 2.96 to 3.45.
- Frontenac Gris was sampled weekly from Sept. 24 to Oct. 9, 2015. The berry pH was 2.9 to 3.16
- All sample analyses are ongoing.



Figure 1. Brianna fermentations from fruit sampled weekly from September 4 to September 25, 2015



Figure 2. Tucker's Walk winery cooperater Dave Greenlee racking off Frontenac Gris.

What the results mean:

- Distinct changes in fruit aroma were noted in Brianna and Frontenac Gris. Little difference in wine color was observed across harvest dates in Brianna in contrast with Frontenac Gris.
- All berry transcriptome, metabolite, aroma and sensory analyses will be conducted in 2016.