



## Viticulture, enology and marketing for cold-hardy grapes



# Sensory Characterization of Frontenac and Marquette Berries and Wines by Descriptive Analysis

South Dakota State University, Brookings, SD  
University of Minnesota, St. Paul, MN

*Emily Del Bel, Zata Vickers, Anne Fennell<sup>2</sup>, Katie Cook<sup>2</sup>*  
*University of Minnesota, South Dakota State University<sup>2</sup>*

**Background and Rationale:** Cold climate grape cultivars have pedigrees that combine *Vitis vinifera*, the classic wine grape species of Europe, with North American *Vitis* species, especially *Vitis riparia*. The flavor profiles of their berries and wines can be dynamic through the ripening period and may include characteristics of the ancestral species or even novel flavors. The objective of these evaluations is to characterize changes to aroma, flavor and astringency attributes that occur during the ripening of Marquette and Frontenac wine grapes and the resulting changes in their respective wines.

### Treatments:

- Grapes grown in the four replications of the NE 1020 trial at Brookings, South Dakota were sampled in 2012 at three stages of maturity indicated by soluble solids content: 22, 24, and 26°Brix.
- Wine was made from the harvest at 26°Brix.
- Descriptive analysis of berries and wines was performed by a panel of 14 people who received 3 to 6 days of group and individual training prior to evaluations to develop their consistency in rating attributes of the fruit and wines.

**Methods:** Frontenac and Marquette grapevines were grown on a high cordon training system in the NE1020 coordinated wine grape variety evaluation planting at SDSU NE Hansen Research Center, Brookings South Dakota. The plot is a randomized complete blocks with 4 replicates of each cultivar or selection (6 vines/replicate). At three timepoints (Brix levels) uniformly distributed clusters were harvested from each vine in the replicate (~4 cluster/vine or 24 clusters/replicate), berries stripped from clusters and a replicate pool (4 separate pools, one for each replicate) were used for replicated brix reading and berries.

Harvested berries were immediately frozen at -80°C, stored in -20°C, and kept frozen until sensory analysis could occur. Fruit was shipped from South Dakota to Minnesota in coolers with dry ice. Wines were made at Prairie Berry Winery using a standard winemaking protocol developed

by the University of Minnesota. Red grapes were crushed, and inoculated with yeast (Uvaferm VRB) immediately after crush. Two days after inoculation with yeast, red wines were also inoculated with lactic acid bacteria (PN4, *Lallemand*). Wines were fermented to dryness, and malolactic fermentation was complete. Marquette was handled slightly differently. There was a gap between fermentation and inoculation with lactic acid bacteria due to winery schedules. It only went through partial malolactic fermentation and was ameliorated to drop the alcohol content. Descriptive analysis of berries and wines was performed by a panel of 14 people who received 3 to 6 days of group and individual training with reference standards for flavors and aromas to develop their consistency in rating attributes of the fruit and wines.

## **Results:**

### **Descriptors for Berries**

Sixteen sensory descriptors were generated that characterized the berries of both Frontenac and Marquette. As expected, the sweetness increased and the sourness and astringency decreased as the grapes ripened. However, the overall intensity of flavor and citrus flavor decreased on ripening. The fermented fruit flavor of Frontenac grapes decreased, and the jammy flavor increased as the grapes ripened. The fresh fruit aroma of Marquette grapes decreased, and the jammy flavor and earthy aroma increased as those grapes ripened.

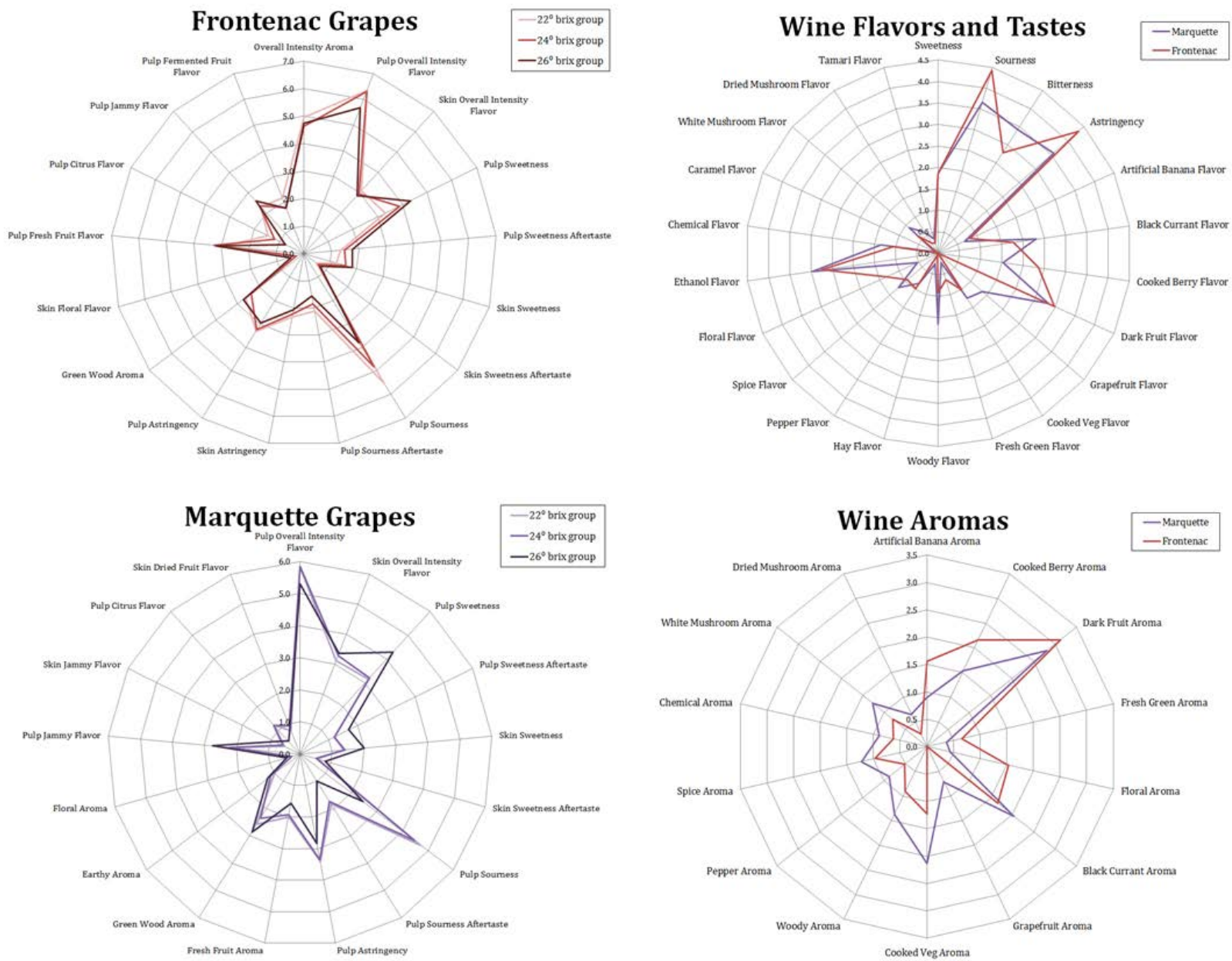
### **Descriptors for Wines**

Twenty sensory descriptors were generated that characterized the Frontenac wine. The aromas and flavors evaluated were artificial banana, black currant, cooked berry, dark fruit, cooked vegetable, fresh green, woody, hay, pepper, spice, floral, ethanol, chemical, white mushroom, dried mushroom, and tamari. The basic tastes that were evaluated were sweetness, sourness, and bitterness. Astringency was also evaluated.

Twenty two sensory descriptors were generated for Marquette wine. The aroma and flavors were the same as those for Frontenac but with the addition of grapefruit and caramel. Sweetness, sourness, bitterness and astringency were also evaluated.

Sourness and astringency were greater in Frontenac, as were the cooked berry flavor, fresh green flavor, and floral flavor. Marquette wine was more bitter than Frontenac, had stronger black currant flavors, cooked vegetable flavors, woody flavors, spice flavors, and grapefruit flavors.

**Figure 1.** Mean values over all judges (N=14), growing replicates, and sensory replicates for significant sensory attributes in grapes and wine.



**What the results mean:**

- As the grapes ripened the sweetness increased and the sourness and astringency decreased as expected.
- The overall intensity of aroma and flavor, as well as the fresh fruit aroma, citrus flavor, and fermented fruit flavor decreased as the grapes ripened.
- Extended hang-time of fruit, while decreasing acidity, may result in the loss of flavor and aroma complexity.
- Preliminary results indicate that Frontenac wine was more sour and astringent than Marquette wine. Frontenac was also higher in cooked berry flavors, fresh green flavors, and floral flavors. Marquette wine was more bitter than Frontenac, had stronger black currant flavors, cooked vegetable flavors, woody flavors, spice flavors, and grapefruit flavors.
- The next step is to examine the wine made from these grapes at different degrees of ripeness to determine whether the aroma and flavor changes are also present in the wine.