Skin Contact Trial in La Crescent

Murli Dharmadhikari[1], Jacek Koziel[1] and Somchai Rice[1], and Anna Katharine Mansfield[2]
Iowa State University[1] and Cornell University[2]

Background/Rationale: Pre-fermentation skin contact treatments are often employed by winemakers to produce aromatic styles of white wines. Selli et.al (2004) reported that skin contact treatments increased the amount of total aroma compounds in Muscat of Bornova wines. The effect of skin contact on the concentration of free and bound aroma compound has not been studied in the cold climate grape cultivars. The goal of this study was to determine if pre-fermentation skin contact treatments on La Crescent and Edelweiss grapes produced a positive impact on wine aroma.

Treatments: Pre-fermentation skin contact temperature treatments were applied at 45˚F and 70˚F for 24 hours. Additionally, a control lot was produced with no skin contact treatment.

Methods:

Wine Production

On September 8, 2014, hand-harvested La Crescent fruit (Table 1) for this study was provided by Tassel Ridge Winery of Leighton, IA. After receiving the fruit was weighed and divided evenly into 3, 276 pound lots. Ambient temperature treatment (Lot A) and control (Lot C) were stored at ambient temperature overnight to prepare for processing while the cold temperature treatment (Lot B) remained in 45 ^{0}F in the cooler. The following day, each lot was processed through the de-stemmer-crusher (Pillan, Italy) into a 20 gallon capacity food grade plastic container and received additions of 40 mg/L sulfur dioxide (Presque Isle Wine Cellars, PA) and 0.057 mL/gal enzyme (Enartis RS). A composite juice sample was taken for analysis (Table 1). A water bladder press (Zambelli, Italy) was used to press Lot C must into 5 gallon glass carboy fermenters to then be stored in 45 ^{0}F cooler to settle until inoculation. Must of Lots A and B were covered and stored for 24 hours at ambient (70 ^{0}F) and cold (45 ^{0}F) temperatures respectively. Following skin contact treatment, each must was mixed and pressed into 5 gallon fermenters and stored at 45^{0}F to settle overnight. The settled juice lots were brought out of the cooler to warm up for 1 hour then racked off the solids into 20 gallon containers for yeast inoculations, juice volume yielded approximately 12 gallons in each lot. Vitilevure 58W3 yeast (Lallemand, Inc., Canada) and Go Ferm (Lallemand, Inc., Canada) were prepared by yeast rehydration protocol (Scott Labs, CA) and added at a rate of 1.0 g/gal and 1.1 g/gal, respectively. Each lot was well-mixed, then evenly distributed into 5 gallon fermenters (3 replicates per lot) and placed into the 55^{0}F cooler. Fermentation monitoring was conducted daily to record Brix, temperature and aroma descriptors; samples were taken on a regular basis to monitor sugar depletion and alcohol production by HPLC. At 1/3 third sugar depletion a nutrient addition in the form of FermaidK (Lallemand,

Inc., Canada) was made. Residual sugar readings of less than 0.2 g/L indicated completion of fermentation. Wines were settled, racked off gross lees and additions of 40 mg/L sulfur dioxide and 0.28 g/gal Lallzyme Beta enzyme (Lallemand, Inc., Canada) were made. A second racking included additions of sulfur dioxide based on pH, bentonite at 0.5 g/gal and Sparkalloid at 1.0 g/gal (all from Presque Isle Wine Cellars, PA). Sulfur dioxide was continually checked and adjusted based on pH. Wines were racked a third time and sulfur dioxide adjusted and a final residual sugar level of 2.25% was achieved. Prior to bottling wines were filtered using Bon Vino Mini Jet filter (Buon Vino Manufacturing, Canada), additions of sucrose and Potassium Sorbate were made to each replicate, well-mixed then gravity filled into sparged 750mL bottles. Samples were taken for chemical analysis (pH, titratable acidity, volatile acidity and sulfur dioxide) and HPLC (ethanol, residual sugars). Finished wines were stored in 45^0F cooler until sensory evaluation. Multiple cooler failures were reported between the time of bottling and sensory analysis however, wines were evaluated internally and determined satisfactory despite the issue.

Table 1. Composite La Crescent Juice Chemistry

pH	Titratable Acidity (g/L)	˚Brix	YAN (mg/L N)
3.23	12.29	20.3	162.44

Sensory Evaluation

A paired comparison sensory evaluation was conducted using 60 panelists to evaluate the wines. Participants were self-selected as white wine consumers, and provided a 20 minute orientation session prior to the evaluation where they signed informed consent documents. Each panelist was then presented 3 sets of 2 samples: A with B, B with C and A with C. Samples were coded using 3 digit random numbers and the order was completely randomized. Wine bottles were numbered and chosen at random across the replicates in each lot. Panelists were asked to indicate the sample with the greatest intensity of aroma. The Chi-square goodness of fit test and Friedman's pairwise and simple ranking tests were used to analyze the data. Additionally, a small breakout session held at the annual Iowa Winegrowers Association meeting in February 2015, gave 22 industry members the opportunity to hear an update on the skin contact study project and taste the wines. Participants were asked to taste each wine and then rank them in order of preference.

Results: Analysis of wines showed a slight increase in volatile acidity in the Lot A, ambient temperature skin contact, treatment and a lower pH in the Lot C, control wine (Table 2). In terms of significance the sensory panel data was inconclusive on which wine had the greatest intensity of aroma. In the pairwise ranking test, a slight trend was seen in B over A and B over C suggesting that the cold skin contact treatment had a greater intensity of aroma than the ambient or control. However panelists were split evenly between A with C. The goodness of fit and simple ranking test results showed that panelists likely could not tell the difference or were not consistent in their choices. In the industry evaluation, the control wine was the most preferred by 45% (10 out of 22).

Table 2. Bottle wine chemical analysis (avg $\pm$ sd of 3 replicates)

	pH	Titratable Acidity (g/L)	Volatile Acidity (g/L)	Free Sulfur Dioxide (mg/L)	Ethanol (%)	Residual Sugars (%)
LOT A	3.50±0.00	10.09±0.28	0.67±0.07	41.28±0.68	11.75±0.02	2.48±0.02
LOT B	3.52±0.00	10.07±0.06	0.55±0.02	31.73±1.00	11.51±0.04	2.52±0.02
LOT C	3.36±0.00	10.11±0.26	0.58±0.05	23.31±1.65	11.93±0.07	2.50±0.02

What the Results mean: The sensory panel was not able to determine if the skin contact treatments at 45^{0}F and 70 ^{0}F produced a wine with greater intensity of aroma compared to the control. It appears that a longer skin contact may be necessary to obtain higher concentrations of aromas in resulting wines.