INTRODUCTION

With the increasing cost and shortage of qualified labor and the desire to economize vineyard operations, mechanizing the harvest process of grapes for wine production has become increasingly important. Although efficient and cost-effective mechanical grape harvesters are available, many resist their application based on concerns that wines made from machine harvested grapes are inferior to those made from hand picked grapes. Concerns associated with mechanical harvesting include berry damage, greater inclusion of material other than grapes (MOG), increased microbial and enzymatic activity between picking and processing, and loss of juice in the vineyard.

The use of optical berry sorting technology has recently become more prevalent in wine production. These units use high pressure jets of air to remove MOG and undesirable grapes based on colour, size, and shape parameters. It has been proposed that using optical sorters during grape processing may alleviate some of the quality concerns associated with mechanical harvesting. The aim of this study was to determine the individual and synergistic effects of mechanical harvesting and optical berry sorting on grape and wine composition.

METHODOLOGY

- Vitis vinifera L. cv. Pinot noir vineyard (clone Dijon 667, 1103 Paulsen rootstock), Russian River Valley A.V.A., CA
- Three harvest treatments: 1) hand picked, 2) standard bow rod mechanical harvester and 3) mechanical harvester (Pellenc America, Inc.) with a Selectiv® Process on-board (removes MOG)
- Split grapes from each harvest method, half unsorted and half optically sorted (Delta Vistalys R1, Bucher Vasilin)
- The rejection rate was 9 ± 1 % (w/w) based on removal of MOG, raisins and crushed fruit
- Triplicate wines were made at the UC Davis Teaching and Research winery (50 mg/L SO₂, 300 ppm WAN, Lalvin® D254)
- Whole berry fermentations at 22 ± 1°C, 3 pump-overs of one tank volume daily, inoculated for malolactic fermentation (MLF) with Vinifera® Oenococcus oeni (Chr. Hansen A/S, Harsholm, Denmark)
- Grape and wine analyses:
  - Phenol composition by Adams-Harbertson (AH) assay and RP-HPLC
  - Volatile analysis by headspace HS-SPME-GC/MS using a method adapted from Hjelmeland et al.
  - Descriptive analysis (DA) of wines 3 months after bottling – 18 attributes (12 aroma, 5 taste and mouthfeel, 1 visual)

RESULTS AND DISCUSSION

- Greater anthocyanin concentrations in machine harvested treatments may be result of greater skin to flesh ratio in the grapes caused by damaged berries losing juice and pulp (Fig. 2)
- Optical sorting led to a significant (p<0.05) increase in anthocyanin concentration in hand picked grapes, potentially due to removal of raisin-like and sun-damaged berries that provide poor anthocyanin extraction
- Optical sorting led to a decrease in total phenolics in the wine (Fig. 3)
- Wines made with the addition of MOG have greater total phenolic content than the control
- Thus the general decrease of phenolic compounds observed in the optically sorted treatments can be due to the removal of MOG
- PSNS had the highest level of total phenolics

Figure 2. Anthocyanin concentration of grape samples. Treatments sharing a letter do not differ significantly (p<0.05).

Figure 3. Total phenolic concentration in wines after 3 months of aging as determined by the AH-assay. Treatments sharing a letter do not differ significantly (p>0.05, n = 3).

- Higher concentrations of these volatiles in grapes from mechanical treatments may be due to glycosidic hydrolysis of their non-volatile precursors
- Similar separations in wines although no specific compound drove differences among treatments

Figure 4. Loadings (A) and score (B) plots of a PCA of the volatile compounds that differed significantly (p<0.05) among grape samples as determined by HS-SPME-GC/MS analysis.

- Tropical fruit and hay saturation were the only sensory attributes that were significantly different among treatments (Fig. 5)
  - HHNS and PSNS had significantly higher tropical fruit aroma although at a low level (highest rating 2.47 out of 10)
  - Optical sorting led to a decrease in hay saturation which is consistent with total phenolic analysis and perhaps a function of not crushing the fruit prior to fermentation

Figure 5. Overlaid score and correlation plots of partial least squares regression (PLSR) analysis between significant (p<0.05) volatile compounds in wines analysed by GC-MS after 3 months in bottle and significant attributes from the corresponding descriptive sensory analysis.

CONCLUSIONS

- Optical sorting decreased differences among the different harvest treatments
- Chemical differences in final wines were likely exaggerated by whole-berry fermentations
- Although significant chemical differences were found among treatments, those differences did not result in wines that were very different
- Only two of 18 sensory attributes were significantly different indicating that the wines were similar in overall character

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REFERENCES

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