Latic acid concentrations in Pinot noir wines from multiple vineyards and vintages from Oregon to Southern California

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Goals

- Evaluate the reproducibility of lactic acid in wines from fifteen different vineyards across three seasons (2017–2019).

Introduction

The conversion of malic acid to lactic acid is responsible for deacidification, flavor modifications, and the microbial stability of wines. The presence of lactic acid in wines is generally through malolactic fermentation (MLF). Lactic acid can also be formed, however, by the presence of microorganisms on grapes or in the winery. The presence of lactic acid in juice at the beginning of fermentation has been shown to have an impact on fermentation outcomes in non-wine fermentations [1,2]. Gene expression data of Pinot noir wines has shown instances of fermentation outcomes that are consistent with the presence of lactic acid in early fermentation from select vineyards. We hypothesize that wines from certain sites, across vintages, will contain more lactic acid than can be attributed to the conversion of malic to lactic acid.

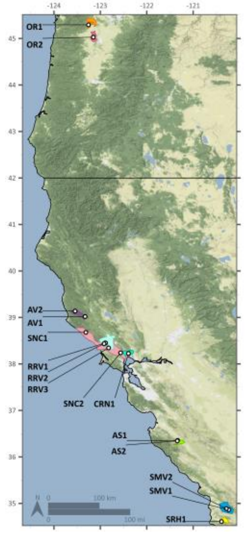

Fig. 1. Fifteen different vineyard sites from Oregon to Southern California

Material and Methods Pinot noir grapes harvested represent eight American Viticultural Areas (AVAs) along the West Coast of the U.S.A (Fig. 1). The wines were produced with a goal of minimizing potential sources of variation, including using a single scion clone of Pinot noir and reproducible and replicated winemaking[3,4]. Grapes were destemmed and inoculated with *Saccharomyces cerevisiae* RC212 yeast. MLF was completed by inoculation of Oenococcus oeni, and the wines were stored in stainless steel vessels until bottling. Malic acid in juices were characterized by enzymatic assay prior to fermentation.

Lactic acid in wines was characterized by using High-Performance Liquid Chromatography (HPLC)[5].

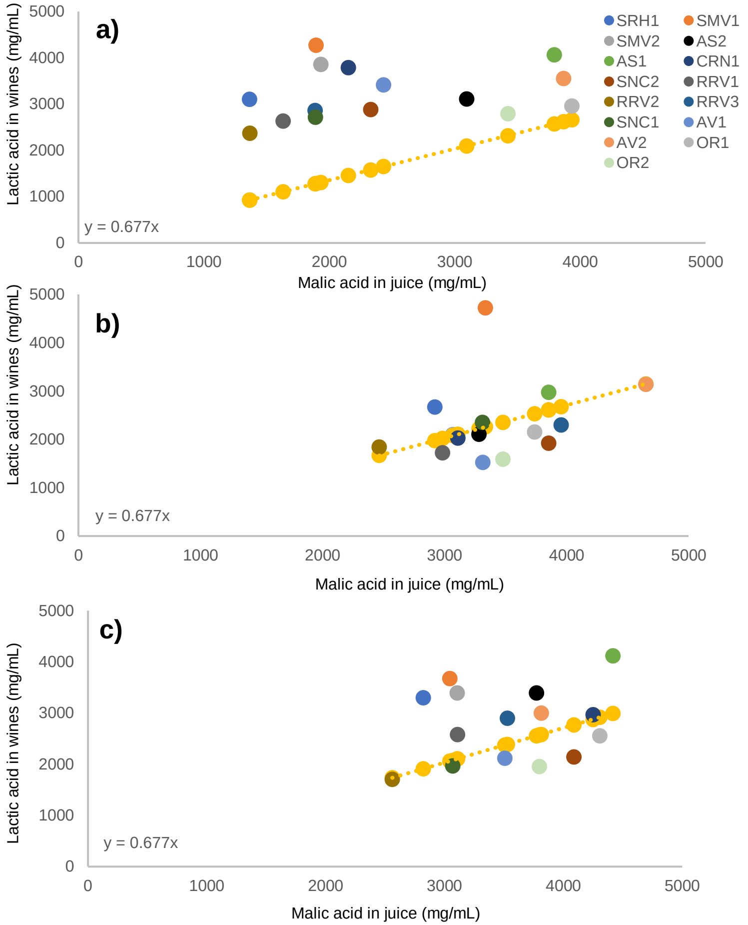

Fig. 2. Graphs show measured malic acid concentrations in juice and lactic acid in wine for the 2017 (a), 2018 (b) and 2019 (c) vintages. Yellow lines indicate the theoretical lactic acid concentration assuming 100% conversion of the malic acid measured in the juice.

Results

For the 2017 vintage, the wines from all vineyard sites presented higher lactic acid concentration than theoretically possible after MLF based on initial malic acid concentration in the juice. In the 2018 vintage, most vineyards show lactic acid levels below or close to the concentration expected, with the notable exception of SMV1 that has higher lactic acid levels than expected. For the 2019 vintage, vineyards in southern California (e.g., SMV1, SMV2, SRH1, AS1 and AS2) have elevated levels of lactic acid.

Discussion and Conclusions

The metabolic activity of lactic acid bacteria is the primary source of lactic acid in wine. We observe that wines from specific vineyard sites (e.g., SMV1 or AS1) have higher lactic acid concentrations than possible based on MLF alone across multiple vintages. These data suggest that there are vineyard-specific microbial populations or grape must condition that contribute to significant differences in wine acid levels that are vintage independent. Moreover, the 2017 vintage showed a larger site-independent shift in lactic acid levels that may be related to weather events or winery activities specific to that vintage. Future studies will be aimed at identifying the features contributing to these site-specific patterns and connecting these conditions to primary fermentation and sensory outcomes.

Acknowledgments

Jackson Family Wines

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