Summary 117

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The effect of *Saccharomyces bayanus*-mediated fermentation on the chemical composition and aroma profile of Chardonnay wine

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• *Saccharomyces cerevisiae* has been the yeast of choice to conduct alcoholic fermentations for many decades. However, controlled inoculations with other yeasts might be able to create a flavor complexity of interest to the winemaker. By comparing the *chemical composition* and *sensory profile* of *S. bayanus*-fermented wines with those of *S. cerevisiae*-fermented wines, the goal of this study was to investigate whether several strains of *S. bayanus* might be of interest in commercial winemaking.

• The authors inoculated lab-scale, sterile-filtered Chardonnay juices (10 liters) with either ***S. cerevisiae*** (strain AWRI 838) or one of two strains of ***S. bayanus*** (AWRI 1176 and 1375), in triplicate. (These strains had been isolated at the Australian Wine Research Institute from spontaneous Chardonnay juice fermentations kept cold). To avoid oxidation at this small scale, all winemaking operations were performed under sterile, high-purity nitrogen gas.

• **Fermentation rate**. While *S. cerevisiae* fermentation rate remained high throughout the fermentation, and sugar was completely consumed in 19 days, the rate of both *S. bayanus* strains decreased markedly on Day 6, and fermentations stuck on Day 8. At this point, the authors added DAP (50 mg/l) and aerated (15 ml of air for 10 seconds) the six *S. bayanus* fermentors, which allowed the fermentations to proceed and reach dryness on Day 29. (The authors note that the juice used had been "highly clarified", due to the requirement of a sterile media prior to yeast inoculation.)

• **Chemical composition**. Compared to wines made with *S. cerevisiae*, wines made with *S. bayanus* contained more: 1) succinic acid, 2) glycerol, 3) acetaldehyde, and 4) SO2; and less 1) acetic acid, 2) malic acid, and 3) ethyl acetate. Within the two *S. bayanus* strains, AWRI 1176 contained significantly more glycerol and acetaldehyde, and less malic acid, than AWRI 1375.

• **Sensory analysis**. Following 6 training sessions, a panel of 13 judges selected 11 attributes to describe the wines, and rated the intensity of each on a scale from 0 (not detectable) to 9 (high intensity). The panel evaluated all 9 wines (3 reps x 3 treatments), presented 3-at-a-time in an incomplete block design. The panel found no significant differences between replicates for any of the attributes. 1) The wines fermented with *S. cerevisiae* were found to be high in "estery", "pineapple", "peach" and "citrus". 2) In contrast, the wines fermented with *S. bayanus* AWRI 1176 were low in these latter attributes, and high in "cooked orange peel", "yeasty", "nutty" and "aldehyde". 3) Wines fermented with *S. bayanus* AWRI 1375 were somehow intermediate (lower than *S. cerevisiae* in "estery" and "citrus", and lower than *S. bayanus* AWRI 1176 in "nutty" and "aldehyde").

Some points the authors state in their discussion:

_ AWRI 1176 and 1375 seem to be the first reported *S. bayanus* strains able to consume malic acid. In their opinion, this would make these strains suitable for high-acid must fermentations;
_ although *S. bayanus* strains failed to produce lower ethanol in the current study, this seemed to be the case in other experiments. Given the increasing interest for lower-alcohol wines, the authors consider that this possible trait of *S. bayanus* merits further study;
_ both *S. bayanus* strains displayed higher "cooked orange peel", also described as "cooked apricot", or still "canned apricot" – an aroma reminiscent of Botrytis-affected sweet wines. The authors believe it would be interesting to determine whether *S. bayanus* could be used to add or enhance a botrytis-like character in certain wines;
_ since both *S. bayanus* strains tested failed to produce aldehyde-like aromas when used in commercial-size fermentations, the authors emphasize that further studies are needed to determine whether the aldehyde character found in this study is due to the *S. bayanus* strain itself or to the small-lot conditions used here;
_ the authors believe that the sensory differences observed were not due to the different fermentation kinetics. They support this belief with the statement that, when commercial scale fermentations were conducted with these same strains, no fermentation-rate problems were observed. But no data is provided;
_ the authors also believe that supplementation with DAP or air in the *S. bayanus* fermentations –but not the *S. cerevisiae* - is not likely to have affected wine aromas. They mention a previous study in which DAP and air failed to modify wine aroma significantly. However, once again, no data is provided.
_ because *S. bayanus* imparts characteristics that would be difficult or impossible to achieve using *S. cerevisiae*, the main benefit of these strains would be, in their opinion, to be used in combination with conventional *S. cerevisiae*, either through co-fermentation or through blending of separately-fermented wines.

In my opinion, the validity of the authors' data hinges heavily on whether or not fermentation kinetics and factors like DAP/air –rather than strain itself- might be responsible for the differences observed. Therefore, the presentation of pertinent data, rather than just a brief allusion to it, seems justified. As it is, the results presented fall short of being able to be put to use with confidence.

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