Vinifera master thesis abstract

Thesis title: *Starmerella bacillaris - Saccharomyces cerevisiae* mixed fermentations: effect on chemical and aromatic parameters of the final wine.

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Abstract (max 300 words)

Topic position & objectives:
The purpose of this study was to explore a biological option for changing the chemical and aromatic composition of wine using the non-*Saccharomyces* yeast *Starmerella bacillaris*. This was achieved by measuring the effect of different commercial *S. cerevisiae* strains when coupled with an indigenous *Starm. bacillaris* strain called FC54.

Methods:
This experiment was composed of 10 different mixed culture fermentations with *Starm. bacillaris* and *S. cerevisiae* and 10 pure culture *S. cerevisiae* control fermentations. The ferments were all conducted in triplicate using pasteurized and homogenized *Vitis vinifera* L. cv Barbera red grape must that had 234 g/L sugar and 180 mg/L yeast assimilable nitrogen (YAN) and the fermentation temperature was controlled to 25 degrees Celsius. The growth dynamics were monitored by plate counts, fermentation metabolites were analysed by high-performance liquid chromatography (HPLC) and the fermentation aroma compounds were measured by gas chromatography–mass spectrometry (GC–MS).

Results:
This research confirmed the high fructophilic character of *Starm. bacillaris* and found this non-Saccharomyces yeast was able to persist well into the mid to late stages of the mixed culture fermentations. Using a 48-hour inoculation protocol *Starm. bacillaris* was shown to reduce the total population and growth rate of *S. cerevisiae*. On average the mixed culture ferments of *Starm. bacillaris* and *S. cerevisiae* reduced ethanol levels by 0.55% (v/v), increased glycerol by 4.49 g/L, and decreased acetic acid by 0.12 g/L compared to the pure culture control ferments with the associated *S. cerevisiae* strain. The composition of the mixed culture ferments and pure culture ferments aroma compounds were found to be significantly different. Importantly the concentration of fatty acids, esters and higher alcohols were found to have significant differences between the pure and mixed culture ferments.

When comparing the impact of each of the *S. cerevisiae* strains in the mixed culture fermentations this research found that the selection of the couples inoculated with *Starm. bacillaris* FC54 significantly changed the levels of alcohol, glycerol, acetic acid, pH, and titratable acidity. The aroma compounds produced by the

mixed culture fermentations were also found to be greatly impacted by the different *S. cerevisiae* couples. 35 of the 37 measured aroma compounds were found to have significantly different concentration levels between the different mixed culture fermentations.

Main conclusions:
Starm. bacillaris was shown in this research to have interesting enological potential. When inoculated with the appropriate *S. cerevisiae* couple *Starm. bacillaris* FC54 was shown to be capable of significantly impacting the ethanol, glycerol, acetic acid, pH, titratable acidity and aroma profile in the resulting wine

Keywords (5):
Starmerella bacillaris, non-*Saccharomyces*, mixed culture, sequential inoculation, ethanol, glycerol, aromatic profile