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Effect of environmentally friendly vineyard protection strategies on yeast ecology during fermentation

AIM: Currently, an increasing concern from governments and consumers about environmental sustainability of wine production provides new challenges for innovation in wine industry. Accordingly, the application of more-environmentally friendly vineyard treatments against fungal diseases (powdery and downy mildew) could have a cascading impact on yeast ecology of wine production. **METHODS:** This study evaluated the effect of a wide range of environmentally friendly products applied in the vineyard on grape yeast ecology at harvest, as well as during spontaneous and inoculated fermentations in winery and laboratory scale conditions. Yeast ecology was investigated using culture-dependent (plate counts) and -independent (Next Generation Sequencing) methods. Main oenological parameters and volatile compounds were monitored during spontaneous and inoculated fermentations. Spearman's correlation was used to assess associations between ASVs changes and chemical composition observed over fermentation. **RESULTS:** No significant differences were observed among the alternative and conventional treatments, compared to the controls, in terms of yeast population and biodiversity. The only exception was the increased population levels of *Aureobasidium pullulans* as response to three alternative treatments. This increase can positively affect the quality and the safety of the grapes, since *A. pullulans* is considered a biocontrol agent of pathogens. Overall, wine composition was greatly influenced by the inoculation, rather than the type of treatment applied previously in the vineyard. Fermentation data suggested that complete alcoholic fermentation was positively correlated to the application of antifungal treatment in the vineyard and the inoculation protocol used. Spontaneous fermentations conducted in laboratory using grapes previously treated with laminarin showed a higher relative frequency of *Saccharomyces cerevisiae* than other treatments, and its corresponding fermentation led to compounds responsible for floral and fruity scents without increasing the levels of the acetic acid. **CONCLUSIONS:** Yeast ecology in fermenting musts may be correlated to specific antifungal products and inoculation protocol employed, suggesting a link between principal active compounds, yeast biodiversity and wine chemical composition. These relationships could help to further control wine quality and improve consumer acceptance and economic value of wines.

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