

Use of immobilized *Saccharomyces cerevisiae* cells to reduce volatile acidity of acidic wines

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Volatile acidity (VA) is one of the major issues of wine quality. Its legal limit is 1.2 g L^{-1} and at concentrations above 0.8 g L^{-1} (1) confers to wine an undesirable acidic taste and unpleasant vinegar aroma. Excessive acetic acid, frequently associated with *Botrytis-cinerea*-infected grapes, is formed by yeasts during fermentation but can also be formed by lactic acid bacteria during malolactic fermentation or as a product of acetic acid bacteria. The commercial strain *Saccharomyces cerevisiae* S26 is able to decrease volatile acidity of acidic wines with a volatile acidity higher than 1.44 g L^{-1} acetic acid (2), with no detrimental impact on wine aroma (3). Herein we assessed the efficiency of acetic acid removal from acidic wines by immobilized cells of strain S26. The results obtained show that immobilized cells of the *S. cerevisiae* strain S26 in double layer alginate-chitosan (DL) beads ($4.0 \times 10^7 \text{ cell mL}^{-1}$ alginate) reduce 21.6% of the initial VA of an acidic wine (1.1 g L^{-1}) with 12.5% (v/v) ethanol and pH 3.5, after 72 h. The level of deacidification did not change after 168 h and was associated with a slight decrease in ethanol concentration (1.1% v/v) and cell leakage from the beads ($3.5 \times 10^4 \text{ CFU mL}^{-1}$). Duplication of the initial cell concentration and decrease of the pH to 3.12, increased VA removal up to 61.8%, depending on the initial acetic acid concentration. Moreover, no cell leakage occurred whereas ethanol concentration slightly decreased (0.7%, v/v). Scanning electron microscopy analysis of immobilized

cells in DL beads confirmed that the initial pH value is critical for beads integrity maintenance. Thus, immobilized *S. cerevisiae* S26 cells in DL beads appear as an efficient alternative to improve wine quality with excessive VA.

[1] Office Internationale de la Vigne et du Vin (2009) Compendium of international methods of wine and must analysis. Vol1 OIV, Paris, p 419.

[2] Vilela-Moura, A.; Schuller, D.; Mendes-Faia, A.; Côte-Real, M. (2008) Reduction of volatile acidity of wines by selected yeast strains. *Appl. Microbiol. Biotechnol.*, 80, 881-890.

[3] Vilela-Moura, A.; Schuller, D.; Mendes-Faia, A.; Côte-Real, M. (2010) Effects of acetic acid, ethanol and SO₂ on the removal of volatile acidity from acidic wines by two *Saccharomyces cerevisiae* commercial strains. *Appl. Microbiol. Biotechnol.*, 87, 1317–1326.