PreSens
PRECISION SENSING

Scientific Paper:

OENO One (2020) 2, 351-358

Acetaldehyde metabolism in industrial strains of *Saccharomyces cerevisiae* inhibited by SO_2 and cooling during alcoholic fermentation

Li Erhu[1] and Mira de Orduña Ramón[2]
[1]College of Food Science and Technology, Huazhong Agricultural University, Wuhan, China
[2]University of Western Switzerland, Changins College of Viticulture and Oenology, Switzerland

Abstract:

Aim: The addition of SO_2 is a common technique for stopping alcoholic fermentation by *Saccharomyces cerevisiae* and producing beverages with residual sugar. However, SO_2 causes a metabolic shift in active yeast leading to the formation of acetaldehyde and resulting in higher preservative SO_2 requirements in the final product. The current work investigated the effects of stopping alcoholic fermentation using two industrial strains of *Saccharomyces cerevisiae*, by means of cooling and/or addition of SO_2, on the kinetics of hexoses and acetaldehyde.
Methods and results: Alcoholic fermentation was conducted by inoculating natural Chardonnay grape must with two commonly used strains of *Saccharomyces cerevisiae* (CY3079 and EC1118). Ten days after inoculation, cooling (to 4 °C) and/or addition of SO_2 (50-350 mg/L) were applied to stop fermentations at approximately 70-90 g/L of residual sugar. Incubations were carried out in an anaerobic chamber to prevent the formation of acetaldehyde resulting from chemical oxidation. Samples were taken regularly and analysed for glucose, fructose and acetaldehyde levels. In this work, addition of SO_2 to 150 mg/L or more were effective in inhibiting further and practically relevant degradation of hexoses even in non-cooled control treatments. With concurrent cooling, an addition to 50 mg/L was sufficient. Addition of SO_2 always led to a slow increase in yeast acetaldehyde formation over time, regardless of cooling or the apparent inhibition of yeast sugar metabolism. Acetaldehyde increases were reduced with larger SO_2 additions.
Conclusion: When using SO_2 to stop alcoholic fermentations, large doses should be used and wines separated from the sedimented biomass soon thereafter. Nevertheless, rapid cooling remains preferable to SO_2 addition and can prevent further microbial formation of acetaldehyde.
Significance and impact of the study: Results from the current work show that acetaldehyde, and therefore bound SO_2 formation, can be reduced when alcoholic fermentation is halted to obtain wines with residual sweetness.

Keywords: yeast, alcoholic fermentation, *Saccharomyces cerevisiae*, acetaldehyde, wine, SO_2, residual sweetness