



## Metabolic engineering of malolactic wine yeast

John I. Husnik <sup>a</sup>, Heinrich Volschenk <sup>b</sup>, Jurgen Bauer <sup>c</sup>, Didier Colavizza <sup>d</sup>, Zongli Luo <sup>a</sup>, Hennie J.J. van Vuuren <sup>a</sup>  

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### Abstract

Malolactic fermentation is essential for the deacidification of high acid grape must. We have constructed a genetically stable industrial strain of *Saccharomyces cerevisiae* by integrating a linear cassette containing the *Schizosaccharomyces pombe* malate permease gene (*mae1*) and the *Oenococcus oeni* malolactic gene (*mleA*) under control of the *S. cerevisiae* *PGK1* promoter and terminator sequences into the *URA3* locus of an industrial wine yeast. The malolactic yeast strain, ML01, fully decarboxylated 5.5 g/l of malate in Chardonnay grape must during the alcoholic fermentation. Analysis of the phenotype, genotype, transcriptome, and proteome revealed that the ML01 yeast is substantially equivalent to the parental industrial wine yeast. The ML01 yeast enjoys 'Generally Regarded As Safe' status from the FDA and is the first genetically enhanced yeast that has been commercialized. Its application will prevent the formation of noxious biogenic amines produced by lactic acid bacteria in wine.