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Evaluation of Commercial and Experimental Malolactic Bacteria Cultures in Oregon Chardonnay and Pinot Noir Wines

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INTRODUCTION

Traditionally, winemakers have relied upon 'spontaneous' malolactic fermentation (MLF) from indigenous species which may take weeks or months to go to completion depending upon the wine and the cellar conditions. Control of MLF has increased with the development of pure MLF bacterial starter cultures. Pure cultures started from slants generally require several days of propagation in a juice or wine media to increase the cell densities and to acclimate the cells to wine conditions prior to inoculation. Cell densities on the order of 10^6 colony forming units per ml (cfu/ml) at the time of inoculation are required for MLF to begin in a timely manner. The development of freeze dried concentrates of MLF bacteria has reduced problems associated with liquid cultures such as lower cell densities, delayed onset of fermentation, and contamination of the cultures in the winery environment during propagation prior to inoculation. The newest generation of freeze dried concentrated MLF bacteria need only be rehydrated prior to inoculating or simply added directly to wine with no preparation. The objective of this research is to evaluate several commercial and experimental freeze-dried malolactic starter cultures for their fermentation rates and effects on composition and sensory characteristics in Chardonnay and Oregon Pinot noir wines.

METHODS AND MATERIALS

MLF trials during the 1998 vintage were conducted with Chardonnay and Pinot noir wine grapes harvested from Woodhall Vineyards in Alpine. Musts were fermented dry using Lalvin CY3079 (Bourgoblanc) and RC212 (Bourgorouge) *Saccharomyces cerevisiae* for the Chardonnay and Pinot noir, respectively. Wines were inoculated in duplicate lots with commercial and experimental strains of malolactic bacteria (MLB) cultures after completion of yeast fermentation according to the manufacturer's instructions. The Lalvin OSU standard culture (Ey2d+Erla) required propagation in a juice/water media prior to inoculation. The Lalvin OSU I-Step (Ey2d+Erla), MBR645 (Erla), MBR648, MBR655 (EQ 54), MBR656 (Ey2d), and Condimenta Bitec vino-D required simple rehydration in water prior to inoculation and Chr. Hansen Viniflora Oenos was added directly to the wine in dry form. Experimental Lalvin cultures 645, 648, and 656 and commercial strain EQ 54 (655) are freeze dried cultures produced by Lallemend, Inc. and designated as 'MBR' strains. The M13R cultures were produced by stressing the bacteria towards the end of the log phase of growth during production in order to invoke physiological adaptations promoting increased survival in wines after inoculation.

Fermentation rates were monitored and measured using the spectrophotometric malate dehydrogenase

assay. Samples of the inoculates and wines were plated on lactic acid bacteria media to monitor the cell population from inoculation through completion of MLF. New wines are to be analyzed for various compositional data including % ethanol, titratable acidity, pH, volatile acidity, residual sugars, total phenols, total anthocyanins, hue ratio, and Hunter colorimetry. The wines from these trials will undergo sensory evaluation by a winemaker panel in the Sensory Laboratory of the Department of Food Science and Technology using the technique of free-choice profiling in order to evaluate their effects on wine color, aroma, and flavor.

CURRENT PROGRESS

The Chardonnay wine was fermented to dryness at 20°C and inoculated with the malolactic cultures. The lag phase before onset of MLF was reduced with the use of 4 of the malolactic cultures, including Lalvin EQ 54, Lalvin 648, Chr. Hansen, and Condimenta, however, the inoculated wines and the uninoculated controls completed MLF in approximately 30 days. Prolonged storage at 20°C (>30 days) for completion of the primary yeast fermentation may have stimulated growth of indigenous MLF bacteria in the Chardonnay wine prior to inoculation (Figs. 1 and 2). Pinot noir wines were inoculated at 20°C after pressing and racking one week after completion of the yeast fermentation. Pinot noir inoculated with Lalvin EQ54 (655), Chr. Hansen, Condimenta, Lalvin 648, Lalvin 656 (Ey2d), and Lalvin OSU I-Step all induced the onset of malolactic fermentation earlier than uninoculated controls. Wines inoculated with Lalvin EQ 54 (655), Chr. Hansen, Condimenta, and Lalvin 648 completed MLF significantly earlier than other inoculations (Figs. 3 and 4). The experimental strain MBR656 (Ey2d) initiated malolactic fermentation more rapidly than the OSU 1-step, the OSU standard, and MBR645 (Erla). When MLF fermentations were 50% completed, duplicate 50 mL samples were taken from fermenters containing the Lallemand Inc. cultures and centrifuged for 10 minutes at 5000 rpm. Supernatants were discarded and samples were sent to Lallemand Inc. laboratories in France to determine the degree of implantation via a genetic marker.

Fig. 1 1998 Chardonnay MLF Trials

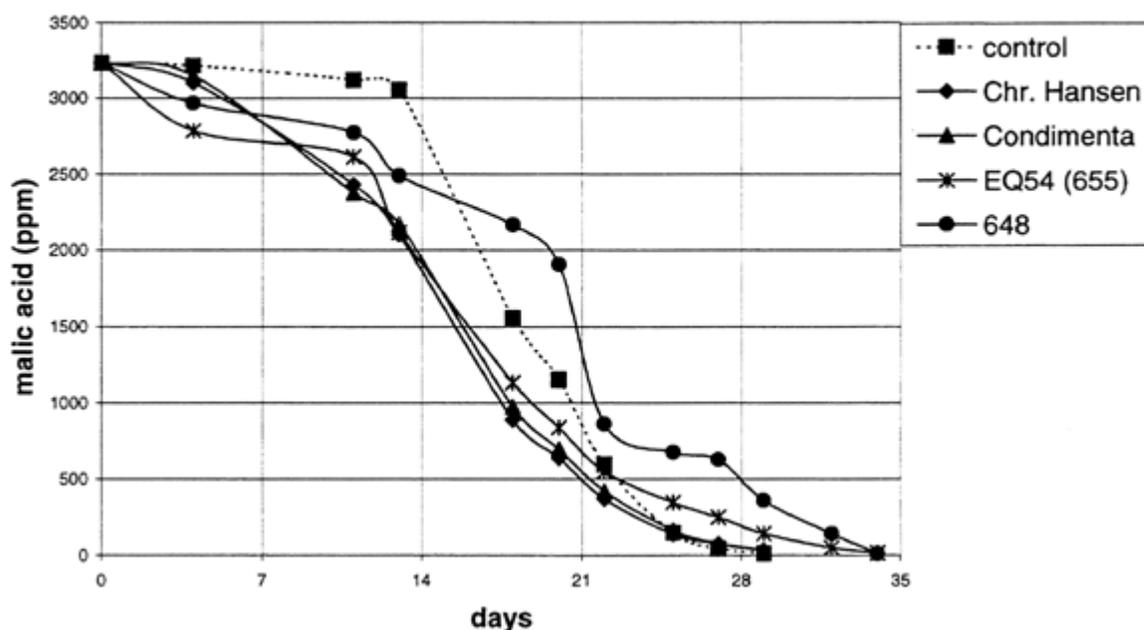


Fig. 2 1998 Chardonnay MLF Trials.

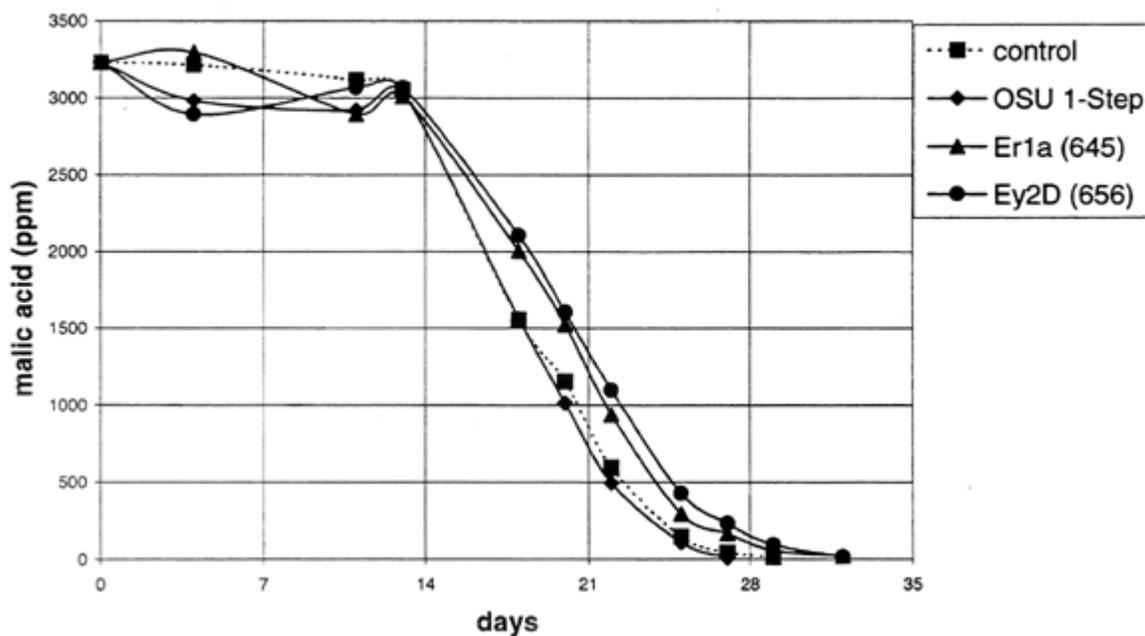


Fig. 3 1998 Pinot noir MLF Trials

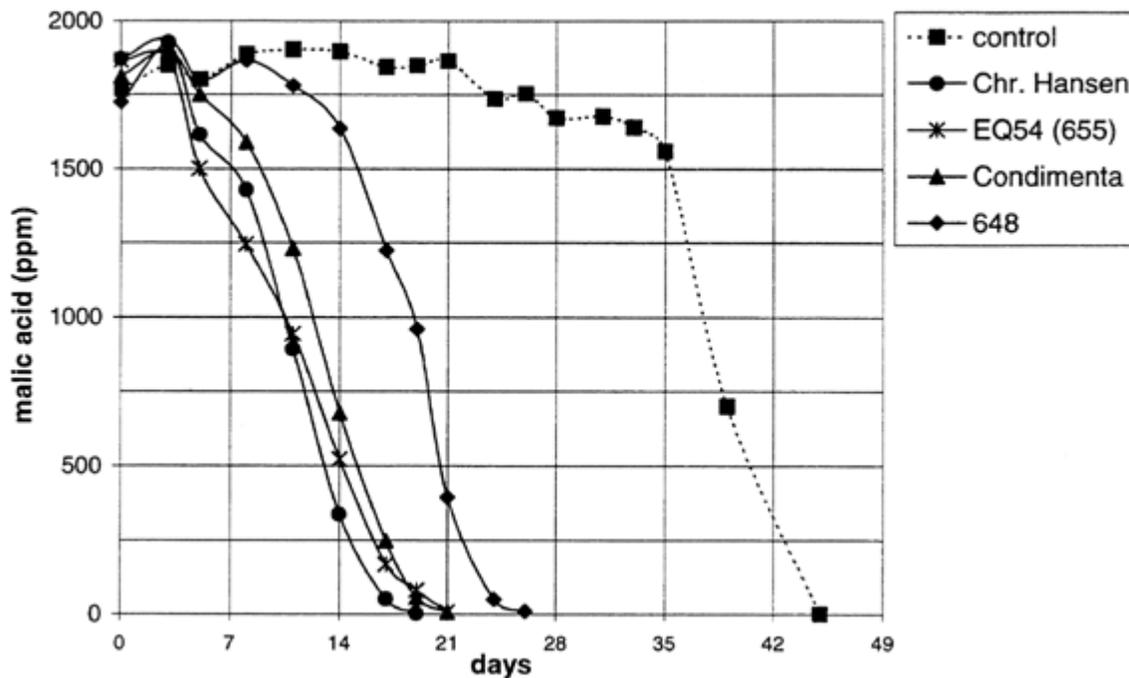


Fig. 4 1998 Pinot noir MLF Trials

