LALLEMAND OENOLOGY

FERMENTING POSITIVE EFFECTS ON **COLOUR, MOUTHFEEL** AND **FRUITINESS**

DEVELOPMENT OF A NEW, INNOVATIVE, SPECIFIC YEAST AUTOLYSATE TO IMPROVE THE QUALITY OF RED WINE. **BY JULIE MEKOUE-NGUELA, ANTHONY SILVANO, JOSE-MARIA HERAS, MARION SCHIAVONE, EVELINE BARTOWSKY & NATHALIE SIECZKOWSKI**

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INTRODUCTION

Consumer demand for fruity red wines with intense colour and good mouthfeel continues to grow. Ageing on lees is a widespread traditional winemaking technique which offers several benefits relating to the aforementioned trend. They include reduced astringency and bitterness, increased body and aromatic length and complexity, as well as the stabilisation of colour of red wines. The release of mannoproteins during lees ageing is also a well-known benefit. To avoid the inconvenience of traditional ageing on lees, a practice has developed over the past 15 years where specific inactivated yeasts are added to promote the release of polysaccharides. Certain polysaccharides can bind with tannins and thereby reduce the astringency of wines.

A recent study at INRA Montpellier that focused on the interactions between mannoproteins and grape or wine polyphenols support the hypothesis that mannoproteins released by specific inactivated yeasts can help improve the taste of red wine by binding with tannins. It is likely that using this type of product (high in mannoproteins) at the beginning of the winemaking process will limit aggregation of tannins and anthocyanins early on, thus improving the colour and mouthfeel of red wine. A recently developed yeast autolysate (MEX-WY1) was shown to have unique mannoprotein properties based on an innovative combination of a special wine strain of *Saccharomyces cerevisiae* (WY1) and a specific inactivation process (MEX).

PHYSICO-CHEMICAL CHARACTERISATION OF THE SPECIFIC YEAST AUTOLYSATE (MEX-WY1)

During recent research atomic force microscopy (AFM) was used to characterise properties of the WY1 wine strain in comparison to another wine yeast strain of *Saccharomyces cerevisiae* (WY2) that displayed strong mannoprotein-producing capacity. WY1 was particularly adhesive and due to its high mannoprotein content and the length of its mannoprotein chains stretched over the cell wall, it interacted strongly with the lectin Concanavalin A, used for its specific ability to link with mannose residues.

AN INNOVATIVE INACTIVATION PROCESS COMBINED WITH A UNIQUE WINE YEAST LEADING TO AN ORIGINAL AUTOLYSATE WITH SPECIFIC PROPERTIES

Various autolysis conditions and thermal or physicochemical inactivation procedures were applied to the WY1 yeast to release its high content and long chain mannoproteins. Following several screening and optimisations in the lab, a specific physicochemical treatment was selected (MEX process) for its ability to disrupt yeast and to release high molecular weight parietal mannoproteins. Transmission electron microscopy (TEM) images showed that autolysates obtained through thermal (SWYT-WY1) and physicochemical treatments (MEX-WY1) had very different appearances. Although thermally inactivated WY1 yeasts maintained a certain cellular integrity and were more than 60% insoluble, physicochemical inactivated yeasts using the MEX process released more components that were 80% soluble.

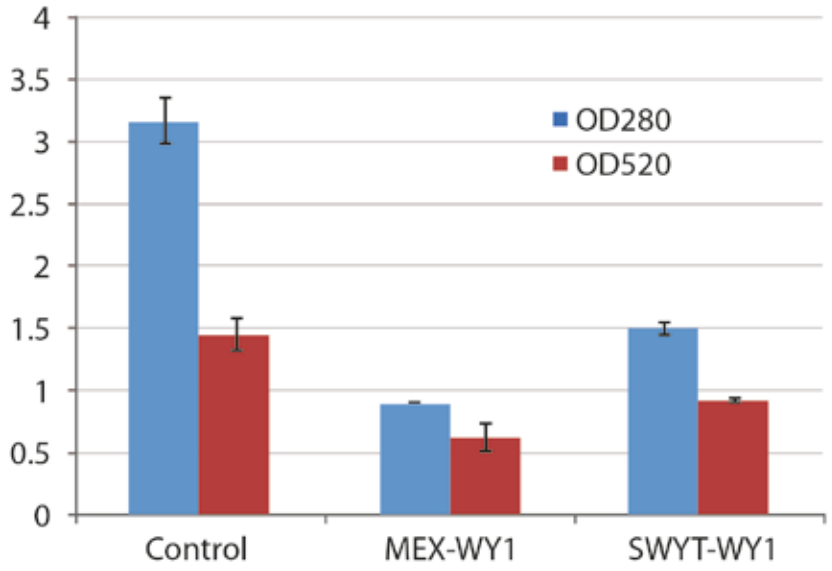

FIGURE 1. Evaluation of BSA-precipitable tannins (OD 280 nm) and pigments (OD 520 nm) in a model red wine fermented with or without the addition of SWYT-WY1 or MEX-WY1 yeast products.

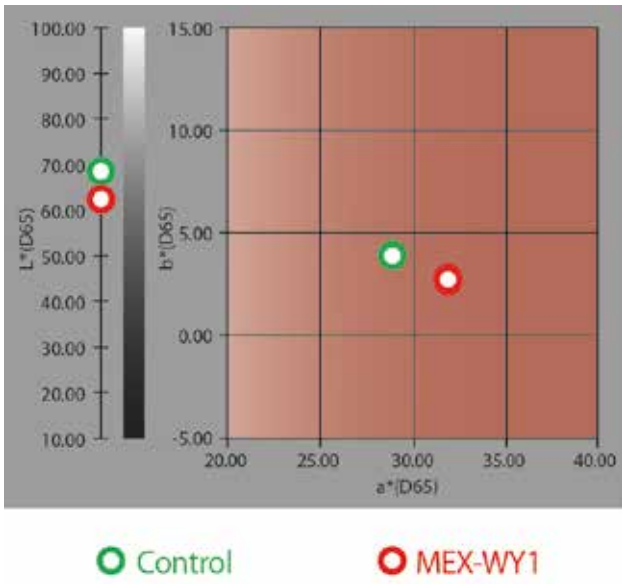

FIGURE 2. Wine colour as determined by CieLab measurements (L, a, b) in Pinot noir wines (Marlborough, New Zealand, 2016) from MEX-WY1 (added at onset of fermentation) and control fermentations.

EVIDENCE OF THE INTERACTIONS OF THE NEW AUTOLYSATE WITH POLYPHENOLS AT THE ONSET OF FERMENTATION

In a lab-scale study, the inactivated SWYT-WY1 yeast and the MEX-WY1 autolysate were added to synthetic must at the beginning of fermentation and compared for their ability to interact with red polyphenols. Bovine serum albumin (BSA) precipitation tests were conducted on the resulting wines to evaluate interactions with polyphenols. Absorbency differences at 280 and 520 nm (OD 280 and OD 520) between the untreated and treated wines indicate the amount of tannins and pigments the protein can precipitate. The capacity of polyphenols to precipitate protein directly affects the astringency of red wine. Figure 1 shows less precipitation of these compounds in treatments using SWYT-WY1 inactivated yeast and autolysate MEX-WY1 compared to the control, with the most marked effect seen with autolysate MEX-WY1.

Further laboratory scale experiments undertaken to understand the mechanism of MEX-WY1 demonstrated the role of macromolecules, mainly composed of mannoproteins with unique properties, in MEX-WY1 autolysate in wine quality improvement, specifically colour stability and astringency.

EVALUATION OF THE MEX-WY1 SPECIFIC AUTOLYSATE DURING RED WINE PRODUCTION

To study the effect of adding the specific autolysate MEX-WY1 under large-scale production conditions, numerous trials were conducted at pilot scale (1 hl) and production scale (50 - 200 hl) on various grape varieties in different grape growing areas in both hemispheres. For each trial, the objective was to compare standard red wine production (control) with MEX-WY1 autolysate (addition rate of 30 g/hl at the onset of alcoholic fermentation) under the same winemaking process. Fermentation kinetics in the numerous trials were not affected by the addition of MEX-WY1.

EFFECT ON THE COLOUR OF RED WINE

In numerous winery scale trials the addition of the specific autolysate MEX-WY1 at the onset of fermentation was observed to have a positive effect on wine colour. Figure 2 shows the colour (parameters L, a, b) measured in Pinot noir wines from trials conducted in New Zealand (Marlborough, 2016). The wine from the fermentation using MEX-WY1 had a darker, more red colour and the ΔE calculated based on the three parameters was 4.7 (trained professionals are able to detect an average ΔE of 3 in red wine).

EFFECT ON THE SENSORY QUALITIES OF RED WINE

Trials using the specific autolysate MEX-WY1 demonstrated that several sensory characteristics of red wine can be improved. These improvements include reduced astringency, better overall mouthfeel, and riper, fruitier aromas.

- ***Significant reduction in astringency***

  The Saliva Precipitation Index (SPI) measures the reactivity of salivary proteins to polyphenols in wine and it is a good estimate of wine astringency. Accordingly the SPI of a Grenache wine that was made with the Thermo Flash (a process which can lead to pronounced astringency due to significant phenolic extraction) was measured. Wine fermented with MEX-WY1 had significantly lower SPI compared with the control, which directly correlates with reduced astringency.

- ***Overall improvement in the mouthfeel and structure of red wine***

  Apart from the reduced astringency observation, most of the trials demonstrated an overall improvement in the perceived wine structure and mouthfeel. Sensory analysis of a Cabernet Sauvignon (Paso Robles, Central Coast, California, 2016) by an expert panel trained in wine texture and structure descriptors showed that the addition of MEX-WY1 significantly improved the five descriptors that were assessed: freshness, volume/roundness, tannin structure and concentration, and length.

- ***Enhanced fruit maturity***

  In a number of the winery trials some unexpected differences in aroma were noted, including fruit maturity, vegetal and grass characteristics. For example, Cabernet Sauvignon (Bordeaux, France, 2016) wine made either with the addition of the specific autolysate MEX-WY1 at a rate of 30g/hl at the onset of fermentation or not, showed different aroma sensory profile (Figure 3). A panel found that the MEX-WY1 treatment produced a significant difference (10% confidence level) in fruit maturity compared to the control. The control wine was also considered to be slightly more vegetal and the MEX-WY1 wine to have more red/black fruit notes.

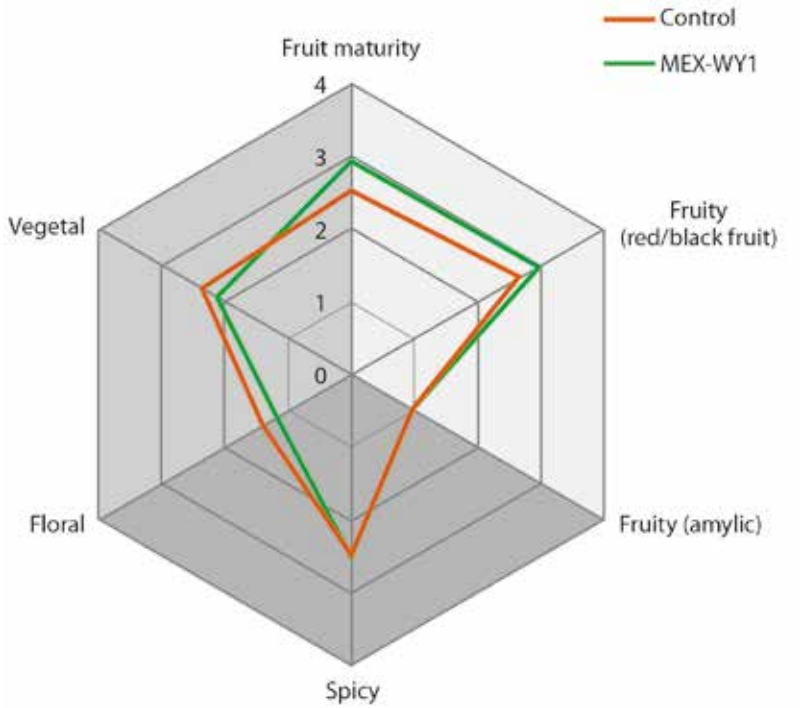

FIGURE 3. Aroma analysis by a panel of second-year student oenologists (Toulouse, France, March 2017) of a Cabernet Sauvignon (Bordeaux, France, 2016) made with the specific autolysate MEX-WY1 (30g/hl) added at the onset of fermentation or without.

SUMMARY

Recent research has provided a much better understanding of how yeast and phenolic compounds interact in red wine, enabling us to better characterise the biochemical and biophysical properties of yeast with unique wine relevant characteristics. We have described the development of a specific wine yeast autolysate (MEX-WY1) with unique wine sensory impacting properties. Studies using model grape must revealed the involvement of mannoproteins in the soluble fraction of the autolysate in the formation of stable complexes that contribute to colour stabilisation and reduction in wine astringency. Winery trials demonstrated that addition of MEX-WY1 at the onset of fermentation had a positive effect on red wine sensory characteristics, such as colour, mouthfeel and fruitiness.

MEX-WY1 has been released as commercial product, OPTI-MUM RED™. The research work described in this article is from a collaboration between INRA/Montpellier Supagro, LISBP/INSA Toulouse and Lallemand.

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