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LALLEMAND

WINEMAKING UPDATE

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LALVIN uvaferm ENOFERM

FLASH NEWS

❖ **Dynamic synergy of BM 4x4**
After years of research, Lallemand has developed the BM4x4 yeast – based on the dynamic synergy of specific yeast strains – to optimize the sensory profile of the wine while relying on a steady fermentation. This product has all the advantages of the BM45 yeast (round mouthfeel, stable colour), while ensuring consistent and complete fermentation in diverse and difficult winemaking conditions.

❖ **Enoferm® T306**
This yeast was selected from a fermenting must at the Tyrell winery in Australia, and has the ability to extract fermentative aromas (floral, fruity and pineapple) that are particularly stable over time. This ability helps not only the expression of the aromas, but the aromatic complexity of the wine as well. Because of the extremely good quality of its lees, Enoferm® T306 is well adapted to aging, increasing smooth mouthfeel, both in the tank and in barrels. With an average fermentation speed, Enoferm® T306 ferments at 16° to 30°C and resists up to 14% alcohol. Known predominantly for its sensory contribution and aromatic expression, Enoferm® T306 is recommended for Riesling, Sauvignon, Sémillon, Chardonnay, Colombard, Chenin Blanc and, other non-aromatic varietals.

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WINEMAKING UPDATE

WINEMAKING UPDATE is published by Lallemand to inform oenologists and winemaking staff about the latest news and applications arising from research. To request previous issues, or to send your questions or comments, contact us at:

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SPECIALTY INACTIVATED YEAST: THE LABOUR OF YEAST BEYOND FERMENTATION

Various types of specialty inactivated yeast (SIY) have been used for many years and are becoming increasingly specialized. This issue of *Winemaking Update* will be devoted to specialty inactivated yeast (SIY). As a special treat, Michel Feuillat, professor emeritus at the Université de Bourgogne and a pioneer on this subject, will share his knowledge of SIY.

1. Inactivated yeast preparations

An inactivated yeast preparation is a dry product made from an oenological strain of yeast that has been treated to suppress its fermentation capacity. The inactivated yeast material is then processed using different techniques, such as enzymatic and/or physico-chemical treatments, followed by purification steps. Derived from the whole yeast cell biomass, all SIY contains a high level of insoluble yeast cell walls and cell membranes (see Section 2), as well as intracellular components. However, each SIY product is highly specialized and differentiated in respect to its content of yeast hulls, soluble mannoproteins and specific compounds, such as micronutrients, sterols and glutathione, etc

2. Learning from the best: Some thoughts from Michel Feuillat

Michel Feuillat has devoted a major portion of his scientific career to the phenomenon of yeast autolysis, particularly as it relates to wine aging. Professor Feuillat answered some key questions about specialty inactivated yeast for us.

Q: What triggers yeast autolysis and the oenological consequences?

MF: Autolysis is an enzymatic, self-destructive process that occurs to dead yeast cells. After the death of the cell, the lysis enzymes become active and, due to their different specificities, they degrade the components of the cell structures. The compounds thus released into the wine have different oenological properties, as described in Table 1.

When white wines in Burgundy are aged on lees in barrels with *bâtonnage*, the autolysis can start after five or six weeks, but the wines cannot be racked before five to six months, in order to take advantage of the enrichment of polysaccharides and other compounds brought to the wines during this process.

Q: Everyone talks about yeast hulls, yeast cell walls and mannoproteins. Can you shed some light on the differences?

MF: Yeast hulls (also known as yeast ghosts or yeast residues) are a product of yeast autolysis and consist of cell walls and membranes. For 20 years, yeast hulls have been used as an adjuvant to help alcoholic fermentation. Their role is to fix medium-chain fatty acids (C_8 to C_{12}) which inhibit yeast activity.

Compared to yeast hulls, **yeast cell walls** have little or no fatty acids as their membranes are removed. They will detoxify the medium. However, the process of obtaining relatively pure cell walls is long and delicate, and feasible only in laboratory situations.

Along with glucans, **mannoproteins** are the major constituent of the yeast cell wall. During autolysis, the partial degradation of glucans by β-glucanases releases mannoproteins.

Q: What does the future hold for inactivated yeast preparations?

Table 1: Components released during yeast autolysis and their actions on wine

Component	Action
Peptides and amino acids	Lactic acid bacteria nutrients (LAB). Peptides can bring sweet or bitter flavours
Nucleotides and nucleosides	Flavouring agents
Mannoproteins and other parietal components	Can stimulate LAB growth, have interactions with aroma compounds, increase volume and mouthfeel, tartaric and protein stabilities

Continued

MF: Independent of its role as alcoholic and malolactic fermentation aids, inactivated yeast can have different roles in wines. For example, glutathione, a sulphur-containing tripeptide, can be found in high quantities in SIY that has been specifically enriched with this compound. Adding glutathione to white wines via inactivated yeast enriched in this compound has been shown to reduce undesirable aroma compounds (H_2S, sulphur compounds etc.) and prevent browning and alteration of aromas during aging and bottling. In addition, SIY will enrich the wines in polysaccharides, especially in glycoproteins, which will increase mouthfeel and volume. This property is similar to an accelerated aging on lees, and is particularly interesting for wines for rapid turnover, where fruity aromas, colour stability and supple tannins are necessary.

3. Possible applications of specialty inactivated yeast

3.1 During yeast rehydration

Yeast rehydration is a crucial phase that prepares the yeast to enter the hostile must environment, with high sugars and low pH, coupled with added SO_2. Through many years of research, Lallemand has developed an efficient and entirely natural process – NATSTEP™ (NATural STErol Protection) – to protect and stimulate active dry wine yeast with a specific SIY at the rehydration stage. The NATSTEP™ rehydration process optimizes levels of specific micronutrients, including vitamins and minerals, plus bioavailable microprotectors – specific sterols and polyunsaturated fatty acids (PUFA) that are taken from inactivated yeast enriched in those specific compounds. These substances are assimilated by the yeast during the rehydration phase, stimulating the reactivation of the yeast metabolism and reinforcing the cell membrane. Yeast rehydrated with this new process acts more efficiently and presents greater resilience in difficult fermentation conditions. At the end of fermentation, the yeast cell membrane is rich in sterols and PUFA and therefore better able to resist high alcohol levels at the end of fermentation.

3.2 For yeast and bacteria nutrition during fermentation

Inactivated yeast contains essential nutritional factors for yeast during fermentation. Added at the right time (usually at a third of the way through fermentation), proper yeast nutrition is essential for a complete and steady fermentation. For many years, inactivated yeast based products such as Fermaid K® (containing inactivated yeast) have shown their usefulness, supplying the fermenting yeast not only with nitrogen, but with essential amino acids, vitamins and minerals to maintain the integrity and fluidity of the membrane (already in top shape because of proper rehydration with the NATSTEP™ procedure) and to facilitate the exchanges between the medium and the yeast cells.

Bacteria nutrition has also benefited from inactivated yeast research. It was found that at the end of alcoholic fermentation the wine can be depleted of essential nutrients necessary for the successful onset of malolactic fermentation. Inactivated yeast based preparations, such as Opti'Malo Plus® or Acti-ML® , have been developed to help malolactic bacteria during fermentation, especially in difficult conditions (low turbidity, presence of MLB inhibitors, high alcohol, low pH and high SO_2).

3.3 To improve sensory properties of wines

- **In red wines**

As Professor Feuillat explained, amino acids, proteins and polysaccharides (mannoproteins) released during yeast autolysis will have different effects on the sensory properties of the wine, i.e., colour stability and increased mouthfeel and volume. Based on this principle, a preparation of inactivated yeast, obtained from selected yeast naturally rich in polyphenol-reactive polysaccharides, was developed.In addition, recent preliminary results (INRA-ICV) have shown that mannoproteins can bind some aromatic compounds (ethyl hexanoate, β-ionone) and make them more stable.

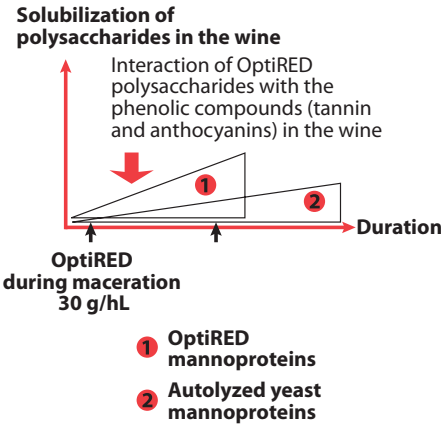
OptiRED® is a natural product that is used in the must and will react with phenolic compounds during maceration, facilitating better color stability and enhancing the right combination of tannins and polysaccharides. The action is described in Fig. 1.

During the tasting of the finished wines, those made with OptiRED® had more structure and more roundness, while respecting the typicity of the varietals and the terroir.

- **In white wines**

As Professor Feuillat has explained, white wines may have premature oxidation problems impacting colour and aroma. During and at the end of fermentation, yeast naturally releases small amounts of glutathione (GSH) into the wine, an antioxidant peptide, in the wine. However, this quantity is insufficient to obtain a significant technological effect. It has been proven that a slight increase in the GSH content of wine (+10 mg/L) may increase fruitiness (+40% increase of 3-mercaptohexan-1-ol (3-MH), a volatile thiol known to contribute positively to the typicity of Sauvignon Blanc), decrease off-flavours and protect colour. Lallemand first developed OptiWHITE®, a specific inactivated yeast with a high GSH content, achieved through a specific fermentation technology and the selection of an appropriate strain. The addition of OptiWHITE® to the juice at the onset or at the end of fermentation increases the GSH concentration and allows a high final content, thus protecting the wine from degradation. OptiWHITE® is also a natural source of yeast polysaccharides that have a very positive effect on mouthfeel.

Figure 1: The impact of OptiRED® on red wine



3.4 To remove undesirable compounds

A study done by the Institut Coopératif du Vin (ICV) showed a reduction of ochratoxin A (OTA) when active dry yeast or inactivated yeast is used in the finished wine. The different preparations seem to adsorb the excess OTA. In wines from 2003 and 2004 with high OTA levels (2.27 µg/L and 2.07 µg/L respectively), trials have shown that the different yeasts (active and inactivated) from the ICV line significantly reduce OTA levels, by up to 1.3 µg/L. The trials also showed that the dosage and the contact time influence the OTA reduction rate.

TO SUMMARIZE ...

Specialty inactivated yeast, in its various forms, is important in every aspect of winemaking, whether it is yeast rehydration, yeast and bacteria nutrition or flavour development. The following general guidelines can be applied, but speak to your Lallemand representative for the best solution for your particular winemaking situation.

- During rehydration, the use of ENOFERM® Protect or Fortiferm® (both from the NATSTEP™ process) is strongly recommended.
- During alcoholic fermentation, the use of Fermaid K® is helpful to complete fermentation particularly under suboptimal conditions.
- During malolactic fermentation, Opti'Malo Plus® or Acti-ML® increases the success of induction by supplying essential nutrients.
- OptiRED® and OptiWHITE®, as well as the recently developed Booster Rouge® and Booster Blanc® (developed by ICV) and RedStyle® and WhiteStyle® are SIY products that can be used to develop the full sensory potential of wine.