selected from nature

LALLEMAND

WINEMAKING UPDATE

Number 1 – 2011

LALVIN uvaferm ENOFERM

NEWS FLASH

- A new biological tool to encourage wine aroma intensity and longevity has been developed by Lallemand. **OptiMUM-White®** is a new, specific inactivated yeast, rich in glutathione, which has antioxidant properties and polysaccharides. The result of a new, natural, optimized production process that enhances glutathione bioavailability, **OptiMUM-White®** is added to the must at the earliest stage of alcoholic fermentation (AF), after settling. **OptiMUM-White®** helps limit the oxidation of colour and aromas.
- On February 24, 2011, the first annual ML Wines competition was organized by Lallemand's ML School. All of the 75 wines, were produced in Spain and Portugal and had undergone malolactic fermentation (MLF) with selected malolactic bacteria (MLB), were tasted and evaluated by over 60 attendees. The winners in the five categories are Bodegas Itsasmendi (Bizkaiko Txakolina), Edra Bodega y Viñedos (Vino de la Tierra Ribera del Gállego-Cinco Villas), Bodegas Vizar (Vino de la Tierra de Castilla León), Quinta Do Crastro (Douro) and Bodegas Barreda (Vino de la Tierra de Castilla). The ML Wines competition was organized to promote and market Spanish and Portuguese wines, and to demonstrate the importance of controlled MLF on wine quality.

LALLEMAND
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:

Lallemand
Gordon Specht
P.O. Box 5512
Petaluma CA 94955 U.S.A.
gspecht@lallemand.com

www.lallemandwine.com

How to Prevent *Brettanomyces*

The consequence of the development of *Brettanomyces bruxellensis* in wines is a major threat to wine quality. These undesirable yeasts, which are able to develop in difficult conditions (such as high alcohol, nutritional depletion, high SO_2, etc.) and during aging, are responsible for producing negative aromatic compounds: volatile phenols (4-ethylphenol, 4-ethylguaiacol and 4-ethylcatechol), characterized by animal type (horse, barnyard, etc.), pharmaceutical (band-aid, medicine, etc.) and ink aromas.

On an international level, the volume of wine affected by this defect is quite important. Some studies show this defect is detected and rejected not only by professionals but by consumers as well. For example, at the International Wine Challenge, a wine competition held in London, England, every year with over 10,000 wines presented, has consistently shown that about 13% of the faulty wines each year are due to excessive volatile phenols – Brett contamination (Harrop, personal communication).

This issue of *Winemaking Update* focuses on various strategies to prevent the development of *Brettanomyces*, and on a new method to eradicate it.

1. Proper alcoholic fermentation management

There is a vast array of different microorganisms that coexist in the grape/must environment. *Saccharomyces* yeast is often dominant during fermentation, due to its resistance to difficult wine conditions, but other yeasts are also present, often microorganisms that can spoil the wine, such as *Zygosaccharomyces*, *Candida*, *Brettanomyces*, etc. As the wine evolves during fermentation, so does the microorganism population and the dominance of each species. *Saccharomyces* is ultimately the winner and completes the fermentation due to its high capacity to survive in the fermenting must. But *Brettanomyces bruxellensis* is also well equipped to survive the harder wine conditions (high alcohol, low pH, SO_2, etc.) and can multiply and produce undesirable compounds which will affect the wine.

The use of selected yeast during fermentation is an effective tool to control the population of indigenous yeast, including *Brettanomyces*. Renouf (2006) has demonstrated that when selected yeast is used in wine, the population of *Brettanomyces* (and consequently ethylphenol) is drastically reduced (Table 1).

In addition to utilizing selected yeast, proper fermentation management is important, because a stuck or sluggish fermentation provides ideal conditions for the development of *Brettanomyces* spoilage yeast. In the same study, Renouf (2006) shows that the proper rehydration of the active dry yeast was also key in microbial population management, such as to contain the proliferation of *Brettanomyces*. For example, it was shown that when a protector is used, especially under difficult conditions, there is less opportunity for a stuck or sluggish fermentation. Consequently, the protector allowed the selected yeast to be in optimum physiological condition to dominate the flora and prevent the development of *Brettanomyces*. **Natstep®**, for example, is an effective protector during yeast rehydration.

2. Malolactic bacteria and Brett – *I was there first...*

The time between the end of alcoholic fermentation and the onset of malolactic fermentation is a critical period. The wine, not yet stabilized, is still at risk for aromatic deviations. The traditional method of inoculating the wine with MLB, or even letting a spontaneous MLF

	Spontaneous fermentation	AF with a strain of selected yeast and specific nutrients
Brettanomyces population (UFC/mL)	6×10^3	6×10^1
4-Ethyl phenol (µg/L)	430	45

Table 1. Interest in utilizing a selected yeast starter and specific nutrients for better control of the microbial ecosystem. (Analyses conducted at the end of AF. Renouf 2006)

Continued

	CELLAR REGULATED AT 18°-19°C			CELLAR REGULATED AT 14°-15°C		
	Control[a]	Bacteria 1	Bacteria 2	Control[a]	Bacteria 1	Bacteria 2
Time required for MLF (days)	58	16	13	124	31	27
Volatile phenol levels (µg/L)						
4-ethylguaiacol	404	8	7	551	20	15
4-ethylphenol	870	17	9	1119	46	32
Average sensory analysis score (on a scale of 1 to 10)						
Visual quality	5.6	6.0	6.0	6.0	5.1	5.1
Aroma quality	3.8	5.1	4.7	3.4	4.8	5.0
Taste quality	3.8	4.9	4.3	3.5	4.9	4.5
Overall quality	3.4	4.7	4.3	3.5	4.9	4.5
Intensity of animal defect	3.8	0.7	0.9	4.4	0.4	1.0

[a] Not inoculated with lactic acid bacteria

Table 2. Volatile phenol production and sensory evaluation of PN2 wines at different temperatures

start, can result in a window of opportunity for *Brettanomyces* to proliferate and produce undesirable compounds.

Alcoholic and malolactic fermentation co-inoculation is a procedure that has gained in popularity, not only because of the time savings, the cost reduction for tank cooling and, very importantly, the sensory contribution, but also because it has been shown that co-inoculation can help prevent the development of *Brettanomyces*. A study by Gerbaux et al. (2009) has shown the potential of co- inoculation in Pinot Noir wines from Burgundy, France, where 50% of the Pinot Noir wines awaiting MLF contain varying amounts of *Brettanomyces* (Gerbaux 2000). The results show that in both experimental and winery trials, the use of MLB limited the development of *Brettanomyces* and the production of ethylphenol and ethylguaiacol. For example, a cellar experiment (Table 2) showed that in the wines produced at higher temperatures, the MLF was faster than those at lower temperatures. Wines produced at higher temperatures, which are more conducive to bacterial growth, contained lower levels of volatile phenols than those produced at lower temperatures. The overall quality of the wines produced with bacterial inoculation was not affected by the two cellar temperatures used, but in all instances, the overall quality was judged better in wines that received MLB and consequently produced lower levels of volatile phenols.

In a trial on a 2006 Cabernet Franc wine, the inoculation with MLB drastically reduced the population of *Brettanomyces* as well as the levels of volatile phenols in the wines (Figure 1).

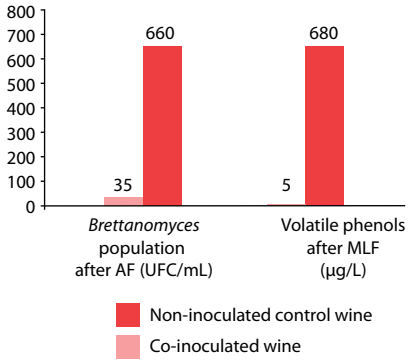

Figure 1. Population of *Brettanomyces* and concentration of volatile phenols in a Cabernet Franc before and after MLF

3. How to Treat Brett-infected wine

Even when all the preventive measures have been used, there can still be an opportunity for *Brettanomyces* in the finished wine, altering its quality right under the nose of the consumer.

If the winemaker is faced with this challenge, some options are offered, but so far there is no miracle solution. The utilization of polyvinylpolypyrolidone (PVPP), charcoal and fining proteins have shown limited results. Other techniques, such as filtration with a 0.45 µm membrane, flash pasteurization, the utilization of dimethyl dicarbonate (DMDC) or high levels of SO_2 are known. But they all come with some disadvantages for the final product. Chitosan of fungal origin, a polymer derived from the chitin in *Aspergillus niger*, appears to be effective for significantly lowering *Brettanomyces* populations in a selective way.

Like starch, cellulose and collagen, chitosan is one of the main natural biopolymers. In fact, chitosan is already widely utilized for its microbial and texturing properties in numerous fields, from agriculture and food, to medicine and cosmetology. There is now a chitosan of fungal origin that is both environmentally friendly (being one of the most widespread molecules on Earth and biodegradable once in contact with soil) and safe (100% non-allergenic). The effectiveness of chitosan for reducing and eliminating major populations of *Brettanomyces bruxellensis* has been confirmed by Aurélie Bornet (doctoral thesis 2006), as well as by many trials by Lallemand and its partners, such as the IOC (Institut Oenologique de Champagne) and the ICV (Institut Coopératif du Vin), which have contributed to the development and validation of this product. After three years of experimenting on some 40 batches totalling more than 6,000 hL, the dosage of 4 g/hL, with 10 days of contact between the fungal-origin chitosan (called **No Brett Inside™**), and the wine, was validated, with successful treatment in 91% of cases (Figure 2).

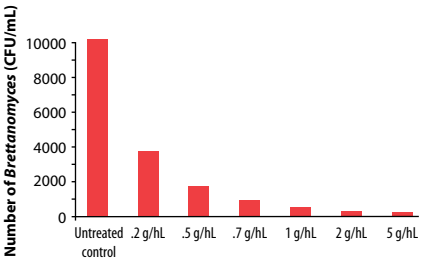

Figure 2. Reducing the population of *Brettanomyces* by incrementally adding chitosan . Source: OIV proceedings, 2008. A. Bornet and P.-L. Teisseidre.

Indeed, the wines that were treated, in duo-trio testing, generally do not show any significant difference with the control wines, and when a difference is perceived the treated wine is systematically preferred.

In July 2009 the Organisation Internationale de la Vigne et du Vin (OIV) accepted the fungal-origin chitosan as a new oenological practice. Since December 2010, the product has been accepted by European regulations.

TO SUMMARIZE...

Brettanomyces is a serious problem for wine quality. It has been clearly shown it is an important wine fault and that consumers are sensitive to it. There are many options for the winemaker to control *Brettanomyces*. The first involves cellar hygiene, but beyond that, fermentation management, both alcoholic and malolactic, are key. The utilization of selected yeast, at a proper dose of 25 g/hL, and of a protectant (**Natstep®**) **at 30 g/hL** during rehydration, plus proper fermentation management with appropriate nutrition, are all essential. The proper yeast choice and its characterization by our R&D team allow us to recommend the best fermentation management strategy. Malolactic fermentation is an essential step to not only stabilize the wine, but to modulate its aroma profile as well. Co-inoculation or rapid post-fermentation inoculation with malolactic bacteria is proven to control *Brettanomyces* development, and allows the full potential of the MLB to be expressed with an appropriate sensory profile. When all other precautions fail, current OIV/European regulations have approved the **No Brett Inside™** chitosan product as an effective tool to stop *Brettanomyces* contamination. For more information on these topics, please contact your Lallemand representative.