Nº6

WINE BACTERIA BIODIVERSITY DRIVING SENSORY STYLE OF RED WINES

Wine bacteria have a more considerable impact on the wine sensory profile than previously thought. New findings have shown that the genetic diversity within the wine bacteria *Oenococcus oeni* is very rich, and that it can have implications on how the wine bacteria perform, especially in terms of revelation of aroma compounds. This Under Investigation will showcase the latest on diversity and sensory impact of wine bacteria.

THE DIVERSITY OF *OENOCOCCUS OENI* FROM WINE TYPE AND REGION

Genome sequencing and subsequent phylogenetic analysis has shown that there is no specificity of bacteria associated with a wine region or winery dispelling the terroir notion of a particular microorganisms associated with a domaine or a terroir. They are dispersed from one region to another, which means that the same strains can be found in different regions. For example, analysis done on grapes, musts and wines in wineries from different wine-growing regions in France since 1950 showed that:

- In the same wine region, 100 to 1000 different *O. oeni* strains can be found
- There are no dominant strains associated with a vineyard
- During spontaneous MLF, up to ten (10) *O. oeni* strains can be found
- A large number of different bacteria can inhabit the same cellar
- The bacterial flora varies from vintage to vintage, and there are not necessarily predominant bacteria in the cellar, independent of the vintage.

The study also reveals subgroups of bacteria which seem to be more suited to a certain type of wine, for example acidic white wines, or cool climate red wines. It appears that the phylogenetic groups (A-C) are driven by adaptation to wine conditions rather than geographical origin. As seen in Figure 1, there is an extensive diversity of wine strains. Lallemand Oenology has selected with its partners, various strains from Group A to offer to winemakers this strain diversity (red dots).

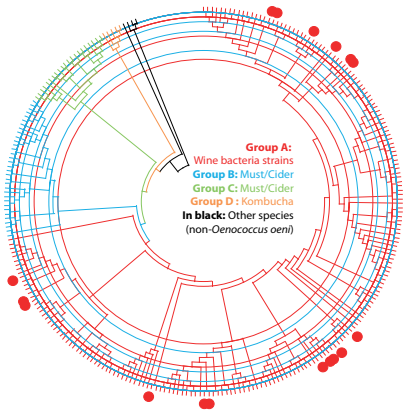

Figure 1. Our different selected wine bacteria (red dots) within the phylogenetic tree of *Oenococcus oeni*.

THE LARGE GENETIC DIVERSITY OF *OENOCOCCUS OENI*

It is now known that strains of *Oenococcus oeni* possess more than 1700 genes. A study carried out on 226 different strains showed great genetic diversity with less than 900 common genes but there are also many variable genes and some of those genes are unique to a specific strain. These variable genes can code for resistance to stress, precise metabolic functions or the production of specific metabolites, which can explain for the differences in physicochemical and sensory properties of each strain. Those new results (Lorentzen et al, 2018) highlight the important genomic diversity within *Oenococcus oeni*.

WINE BACTERIA GENOMIC BIODIVERSITY LEADS TO DIFFERENT SENSORY CONTRIBUTION

For more than 15 years, Lallemand Oenology has shown that there are aromatic differences between wines in terms of structure, freshness, fruitiness, vegetative aromas, and roundness, in red and white wines, fermented with our different *O. oeni*. New genetic and metabolomic analyses support and illustrate our findings.

The use of metabolomics studies has confirmed that MLF and the bacteria strains used to perform MLF, have an important impact on the wines composition. Figure 2 clearly shows 3 separated groups linked to the production of metabolites (more than 1100) in co-inoculated wines with two different bacteria (VP41™ or BETA™) versus a wine that did not go through MLF.

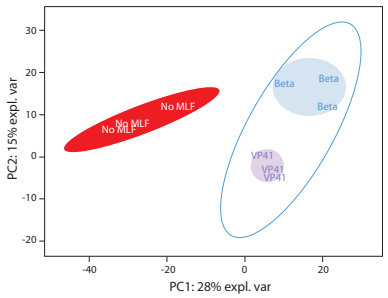

Figure 2. PCA analysis of more than 1100 metabolites (HR-MS) and the impact of 2 wine bacteria in co-inoculation (VP41™ and BETA™) against no MLF

The same results are obtained when wine bacteria are inoculated in post AF inoculation (results not shown). The production of various metabolites during MLF impact the wine sensory profile, and can be measured during tastings with variations in aroma and flavor descriptors observed between different wine bacteria strains (Figure 3).

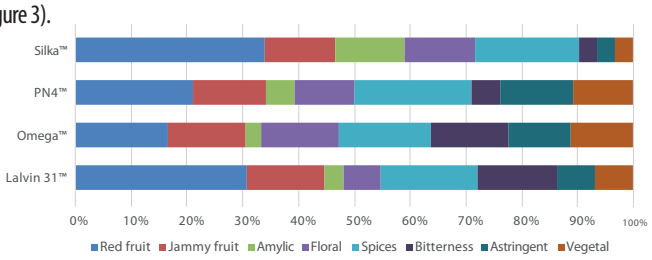

Figure 3. Sensory descriptors perceived by expert tasters in Pinot Noir (IFV Beaune) fermented with 4 different selected wine bacteria used in sequential inoculation.

CAN WINE CONSUMERS PERCEIVE THE IMPACT OF OUR SELECTED WINE BACTERIA ?

Christine Marsiglio (MW research study) measured the perception of U.K. wine consumers of a Pinot Noir (Carneros, California) and a Chardonnay (Tumbarumba, Australia), both fermented with different selected wine bacteria. Consumers were able to perceive significant differences between Chardonnay wines in terms of the "creamy", fruity, freshness and liveliness descriptors. The differences in Pinot Noir wines were seen in the different descriptors such as cherries, herbal, texture of the wines. The important genetic diversity of our *Oenococcus oeni* is at the origin of the differences in their sensory expression in red and white wines.