# Nutrients & Protectors under investigation

## Nº2 OPTIMAL WINE YEAST NUTRITION FOR MAXIMUM AROMATIC EXPRESSION IN CHARDONNAY

Wine yeasts are able to produce volatile aroma compounds from precursors found in the grape musts. Despite this ability, the wine yeast needs an adapted nutrition management (type of nutrient and timing of addition) that will maximize this secondary metabolism. Work done in collaboration with INRA (Montpellier, France) has shown that the type of nutrient, and the timing of addition during alcoholic fermentation has an important impact on the production of fermentative aroma compounds.

### THE IMPORTANCE OF COMPLETE NUTRITION IN AROMA PRODUCTION

Nitrogen is a key factor that has a significant impact on wine fermentation. It is the most important yeast nutrient, influencing both fermentation kinetics and wine quality. It represents an important nutritional factor for yeast during alcoholic fermentation due to its function in protein synthesis and sugar transport, and is essential for the biosynthesis of higher alcohols, thiols and esters by wine yeast. The metabolism of nitrogen, notably amino acids, generates the formation of numerous aroma compounds involved in the aroma matrix of wine: higher alcohols and their acetates. As a result, the nitrogen composition of the must can modulate the aroma profile of the wine. The use of organic nutrients has also been shown to influence the formation of aroma compounds when used during alcoholic fermentation better than inorganic sources. Yeast cells are incredibly rich in nitrogen originating from peptides, tripeptides, free amino acids (Figure 1), and therefore yeast autolysates supply a complete nutritional environment to maximize the aroma metabolism in yeasts and develop the potential to optimize the yeast's capacity to produce fermentative aromas.

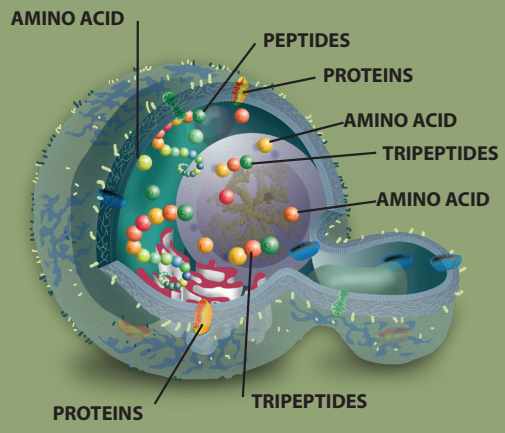


Figure 1: Portrayal of a yeast cell indicating where N-containing compounds (amino acids, peptides and proteins) are found.

### STIMULA CHARDONNAY ™

Stimula Chardonnay™ has been developed from our understanding of the impact of yeast autolysate components on wine yeast during alcoholic fermentation. It is composed of 100% yeast autolysate products formulated to supply the optimal levels of amino acids, sterols, vitamins and minerals known to optimize the aromatic yeast metabolism. It is also particularly rich in biotin, B6 vitamins, and in magnesium and zinc which augment the volatile ester biosynthesis by the yeast. Vitamins for instance are known to be important yeast growth factors, but also co-factors of several enzymatic reactions and so contribute to metabolic pathways, including aroma compounds biosynthesis. Their uptake from the juice by the yeast is by recently identified specific membrane transporters (Paalme *et al*, 2014).

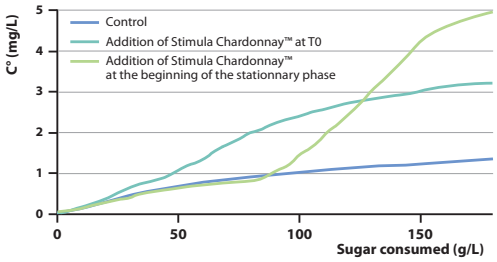


Figure 2: Total production of isoamyl acetate as a function of the sugar consumed for fermentations with the addition of commercial product at T0 or at the beginning of the stationary phase.

Not only are the constituents of the yeast autolysate important, but also when it is added during alcoholic fermentation. It has been demonstrated that the yeast switches from a primary growth metabolism to a secondary aromatic metabolism of ester biosynthesis at the end of the growth phase. Thus adding Stimula Chardonnay™ at this moment will enhance this metabolism switch and optimize the biosynthesis of aroma compounds and support the bioconversions of precursors to volatile esters until the end of fermentation. As shown in figure 2, the production of the ester isoamyl acetate is greater when Stimula Chardonnay™ is added before the stationary phase (1/3 through fermentation) compared to when added at the beginning of AF (beginning of sugar being consumed in function of $CO_2$ produced).

### IMPACT ON WINE

The specific Stimula developed in collaboration with INRA (Montpellier, France) was tested in different Chardonnay winemaking situations as well as with different wine yeasts. In a trial done on Chardonnay (2018 Napa Valley, USA), the wine yeast Cross Evolution™ was used with Stimula Chardonnay™ versus the same yeast without. The tasting notes showed that the control wine was clean, very tart and neutral whereas the Stimula Chadonnay™ wine was not as lean, had definite mouthfeel improvement and 'pear drop' aromas that were very appealing. Figure 3 shows the interesting impact on the sum of esters (ethyl and acetates). More precisely, the biggest differences between control and Stimula Chardonnay™ were observed in 2-phenyl ethanol, and phenyl ethyl acetate both described as floral (around +15%) on ethyl hexanoate (pineapple) ethyl octanoate, ethyl decanoate (+76%), ethyl butanoate (described as fruity and floral) as showed in Figure 4

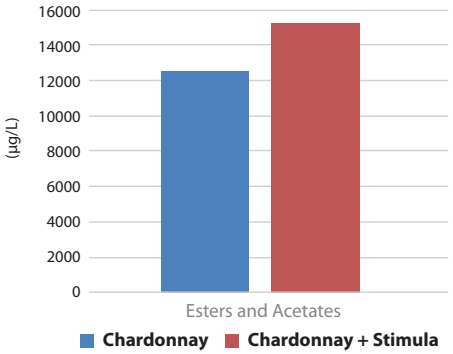


Figure 3: Sum of the total esters and acetates (Chardonnay; Napa Valley USA, 2018)

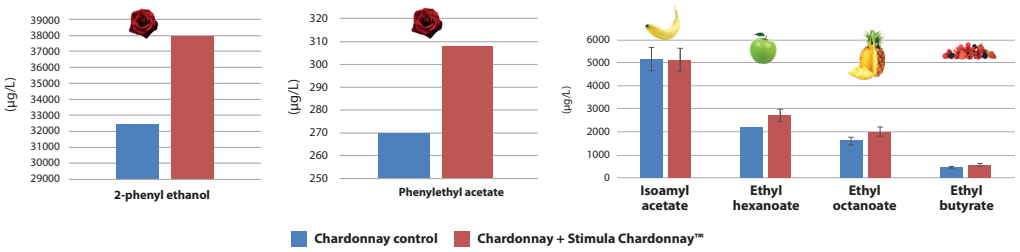


Figure 4: Impact of Stimula Chardonnay™ addition (at T 1/3 AF) on ester concentrations in Chardonnay (Napa Valley USA, 2018)