

## ENARTIS NEWS

### IMPROVE COLOUR STABILITY

*Colour is part of red wine quality. It is not only a visual attribute, but also essentially contributes to wine taste. Whether it be poor or exceptional grapes, in both cases extracting, protecting and stabilising colour improves wine quality overall.*

### HOW TO IMPROVE COLOUR STABILITY

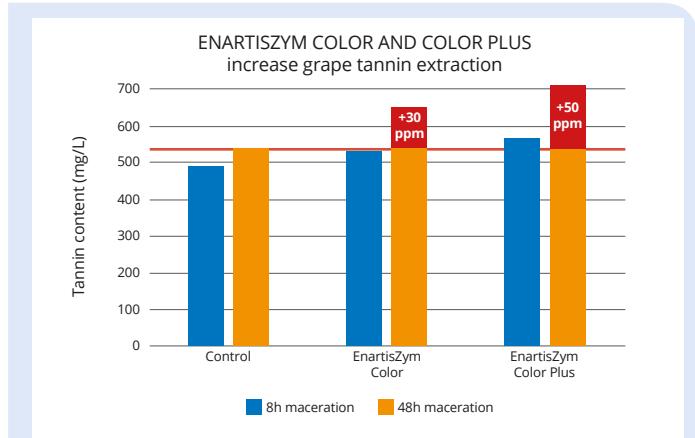
#### 1) Maximising extraction of phenolic compounds

Grape phenolic compounds, anthocyanins and tannins, are important for the organoleptic properties, colour stability and ageing potential of future red wines.

**Anthocyanins** are the only red pigments present in grapes. They are water-soluble small molecules located in the berry skin cells therefore their extraction happens quite easily and rapidly in the early stages of maceration. Anthocyanins are very sensitive to oxidation and over time become unstable due to degradation and precipitation reactions. This is the reason why they play a vital role in determining wine colour in the first stages of vinification.

**Grape tannins** are located both in the berry skin cells and in the seeds. They can have very different composition, structure and dimension. The smallest tannins contained in the berry are water-soluble and can be extracted quite easily. The biggest ones require that the berry skin cells be degraded to allow their diffusion into the must. Tannins from the seeds are solubilized when the external cuticle is dissolved by ethanol, i.e. towards the mid-point of alcoholic fermentation.

One of the ways to increase phenolic extraction from berry skins is with the use of maceration enzymes such as **EnartisZym Color** and **EnartisZym Color Plus**. Their pectolitic, cellulase and hemicellulase activities ensure the degradation of berry cell walls, increasing permeability, which facilitates the diffusion of anthocyanins and, more importantly, accelerates the extraction of tannins into the must (Graph 1). More tannins in solution in the very first stages of fermentation, when conditions are favourable to the formation of anthocyanin/tannin complex structures, improves long-term colour stability.



Graph 1: in 48 hours maceration, the use of EnartisZym Color and Color Plus increased grape tannin extraction by respectively the equivalent of 3 g/hL and 5 g/hL compared to the untreated control (Tempranillo grapes).

#### 2) Preserve anthocyanins and grape tannins

Anthocyanins are sensitive to oxidation when they are in their natural form. They must be combined with tannins or other co-factors to form more stable pigments.

Anthocyanins and tannins are extracted at different stages during the fermentation process. Anthocyanins are water-soluble thus extracted earlier in the process which makes them more susceptible to oxidation if not stabilised rapidly. A prompt antioxidant protection, as soon as there is juice formation, prevents their degradation.

During transport or at grape reception, **AST** (ascorbic acid, potassium metabisulphite and gallic tannin) guarantees a prompt and complete antioxidant and antimicrobial action.

At crushing, while filling the maceration tank or during cold soak, sacrificial tannins based on mixtures of hydrolysable and condensed tannins such as **EnartisTan FP** and **EnartisTan Rouge** help to preserve anthocyanins and grape tannins. The hydrolysable (ellagic and gallic) tannins act as oxygen and free radical scavengers and interfere with oxidases (laccase and tyrosinase) activity, protecting anthocyanins from oxidation. Condensed tannins have two roles:

- 1) Precipitate grape proteins thus preventing freshly extracted skin tannins (one of the most effective tannins for colour stability) from precipitating.

2) Participate in stabilization reactions (mainly co-pigmentation) to form more stable colour pigments.

### 3) Help long-term stable pigment formation

The initial colour of red wine is mainly due to anthocyanins extracted from grapes during the winemaking process. Because of their sensitivity to oxidation, they do not adequately ensure a bright, fresh colour over time, and thus must be combined with tannins or other co-factors to form more stable pigments via co-pigmentation or condensation reactions.

**Co-pigmentation** is the enhancement of colour intensity and tint due to formation of complexes between anthocyanins and cofactors such as flavonols, hydroxycinnamic acids and/or colloids via a weak bond (hydrophobic and hydrophilic interactions). Co-pigments play an important role in protecting anthocyanins from oxidation during the first stages of fermentation. A large portion of the colour in young red wines originates from these "semi-stable" pigments.

**Condensation** leads to more stable pigments long-term. Condensed pigments can be formed via the direct bonds between anthocyanins and tannins or, in an oxidative environment, via acetaldehyde bridges. For these reactions to occur, there needs to be condensed grape tannins present in the must or wine. Condensation leads to pigments and colour complexes which are stable and resistant to oxidation.

For young red wines and rosés, the use of **EnartisTan XC** during the alcoholic fermentation, promotes the formation of semi-stable pigments via co-pigmentation (Figure 1). **EnartisTan XC** is a blend

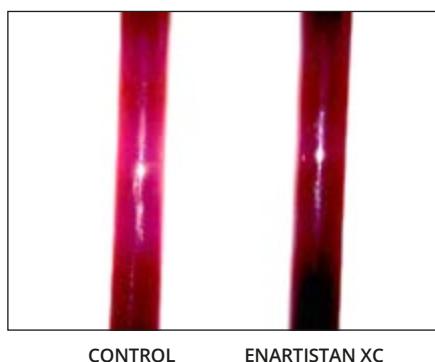
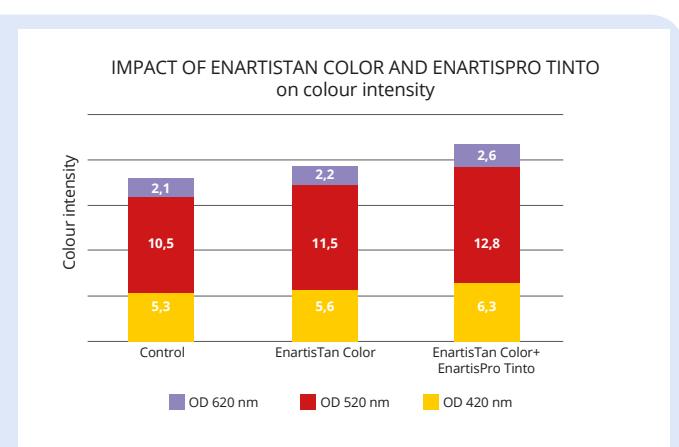


Figure 1: EnartisTan XC increases wine colour stability by copigmentation

containing condensed tannins with a molecular structure very similar to that of grape tannins and selected for their ability in combining anthocyanins. The hydrolysable tannin fraction protects the condensed tannins and makes it possible to use **EnartisTan XC** like a sacrificial tannin during the filling of the fermentation tank.

For wines destined for longer ageing, where the objective is to create a very stable colour, **EnartisTan V** or **EnartisTan Color** provide grape tannins that can combine anthocyanins in condensed forms. Best results are obtained when these tannins are added at the beginning of the fermentation, when alcohol is below 4%. Additionally, additives containing readily available mannoproteins can be very beneficial to protect colour and improve its stability (Graph 2). The mannoproteins immediately released by the **EnartisPro products** are able to interact with anthocyanins and form complexes that are less sensitive to oxidation. Furthermore, the interaction between yeast polysaccharides and tannins can significantly affect the perception of tannin astringency creating a fuller structure and better integration on the palate.

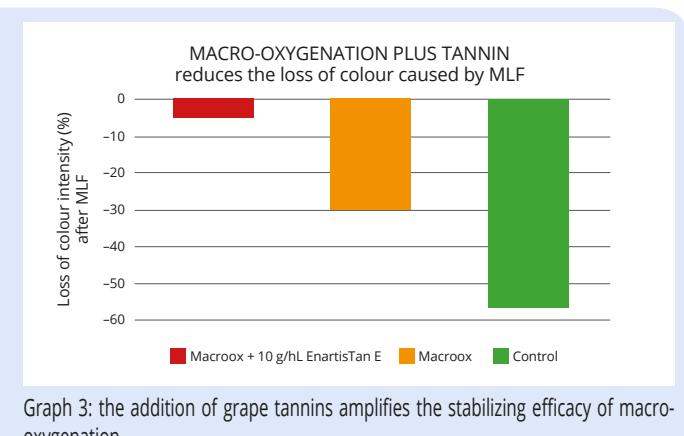


Graph 2: addition of grape tannins and EnartisPro products in the early stages of grape maceration helps wine colour stability.

## MACRO-OXYGENATION: THE LAST OPPORTUNITY TO STABILISE COLOR

Oxygen added in the period between alcoholic and malolactic fermentation, induces the production of acetaldehyde, a product of ethanol oxidation. This compound acts as a bridge in polymerisation reactions involving tannins and anthocyanins, creating stable colour compounds that contribute a deep mauve color and a soft tannicity.

The addition of tannins specifically designed for this application like **EnartisTan E** (grape seed extract rich in monocatechins) amplifies the effect of the macro-oxygenation increasing the fraction of anthocyanins converted to more stable forms (Graph 3).



#### ENARTIS SUGGESTIONS FOR IMPROVING WINE COLOUR STABILITY

	Easy drinking Red Wine	Premium Red Wine
<b>TRANSPORT OF GRAPES</b>	100-150 g/ton AST	100-150 g/ton AST
<b>CRUSHER</b>	200-300 g/ton EnartisTan FP or Rouge	200-300 g/ton EnartisTan Color
<b>IN THE FERMENTATION TANK</b>	20-40 g/ton EnartisZym Color Plus	20-40 g/ton EnartisZym Color Plus
<b>WHEN CAP RISES</b>	100 g/ton EnartisTan XC	100 g/ton EnartisTan V
<b>2/3 SUGAR DEPLETION OR AT PRESS</b>	50 g/ton EnartisTan XC	-
<b>BETWEEN AF AND MLF</b>	-	100 g/ton EnartisTan E + 10-15 mg/L of O <sub>2</sub> over 3-5 days

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