



## WINEMAKING GUIDELINES

### Managing Green Characters Red Wines

#### Which Compounds are Responsible for Green Notes in Wine?

Most compounds that cause unwanted green notes in wine are synthesized by grapes and concentrated in the skins. These belong to two groups:

**Methoxypyrazines:** Responsible for herbaceous, green bell pepper, asparagus, pea and earthy aromas. Sensitive to heat, methoxypyrazines concentration can be lowered by thermo-treatment or/and high temperature fermentation.

**C6 Compounds:** Characterized by unpleasant green aromas such as tomato leaf and cut grass. Present in unripe grapes, these compounds can also be formed from unsaturated fatty acids through an enzymatic cascade.

#### How to Reduce Green Characters in Wine?

1. Good **anti-oxidant protection** is necessary to limit the formation of more C6 compounds by enzymatic oxidation of lipids
2. **Limit skin contact** to reduce extraction of off-aromas: avoid cold soak and extended maceration, press early and promote a fast fermentation
3. **Compensate** for the short skin contact with **fast extraction of polyphenols** using specific extraction enzymes
4. **Eliminate** some green compounds with heat: thermo-vinification or high temperature fermentation
5. Proper yeast nutrition strategy:
  - o **Nutrifer Arom Plus** provides essential nutrients for proper yeast development and aromatic precursors at inoculation
  - o **Nutrifer Advance** to help yeast with resistance to stress and reduce production of H<sub>2</sub>S (add at 1/3 sugar depletion)
  - o **Nutrifer No Stop** improves yeast cell membrane fluidity, yeast fermentation activity and resistance to stress and ensure a complete fermentation (add at 1/2 of fermentation)
6. Promote color intensity and stability by promoting condensation and co-pigmentation reactions
7. Balance wine mouthfeel with mannoproteins and fermentation tannins
8. Mask some green notes during fermentation:
  - o Use of oak alternatives
  - o Use of sulfur donor compounds (such as yeast derivatives rich in sulfur containing aminoacids and peptides) to promote the conversion of C6 compounds into thiol precursors

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STAGE	OBJECTIVE	ENARTIS PRODUCTS	DOSE
Harvest/ Vineyard	Antioxidant	<b>AST</b> is a blend of ascorbic acid, gallic tannins and SO <sub>2</sub> for complete antioxidant protection. 100ppm of AST = 28 ppm SO <sub>2</sub> .	
Crush	Extraction Enzyme	<b>Enartis Zym Color Plus</b> : Pectinase, cellulase, hemicellulase and protease activity. Improves polyphenol extraction, reduces instable proteins, improves filterability and pressing yield and helps color stability.	20-40 g/ton
	Tannins	<b>Enartis Tan Fermcolor</b> protects polyphenols from oxidation, contributes to color stability and improves wine structure and aromatic complexity.	200 g/ton
<i>Recommended analysis: Brix, pH, TA, YAN, Malic Acid, Microscan, pH and Acid Management Panel Reduce cold soak and skin contact to limit extraction of vegetal characters. Acid adjustments, brix adjustments.</i>			
Inoculation	Nutrients	<i>At inoculation, adjust YAN &gt; 150 ppm with complex nutrient.</i> <b>Nutriform Arom Plus</b> provides essential nutrients for the proper yeast development: amino acids, vitamins and mineral salts and aromatic precursors to enhance fermentation aromas.	300 g/ton
	Yeast	<b>Enartis Ferm ES488</b> : <i>S.cerevisiae</i> with β-lyase activities. Increases varietal aroma expression, reduces green characters and promotes red fruit and spice notes. <b>Enartis Ferm D20</b> : <i>S.cerevisiae</i> ferments at high temperatures, promotes polyphenol extraction and respects terroir characters.	200 g/ton
	Polysaccharides	<b>Enartis Pro Blanco</b> : Yeast cell wall polysaccharides rich in sulfur-containing peptides. Acts in synergy with Enartis Ferm ES488 to transform C6 compounds into thiolic compounds. Promotes varietal aroma production, reduces green characters and balances mid-palate.	400 g/ton
<i>Fermentation temperature: 25-30°C (77-86°F) with ES488; 32-35°C (90-95°F) with D20</i>			
1/3 Fermentation	Yeast Nutrients	<b>Nutriform Advance</b> : Organic and inorganic nitrogen, yeast cell walls rich in sterols, fatty acids and cellulose. Helps yeast with stress resistance, detoxifies wine, ensures complete fermentation and reduces production of H <sub>2</sub> S.	300-500 g/ton
	Oxygen	<b>Enartis MicroOx</b> or pump-over.	10 mg/L
	Oak Extract	<b>Incanto NC Red</b> : Oak extract. Soluble mixture of toasted oak tannin and yeast polysaccharides. Mimics the effect of medium-plus oak chips. Decreases green characters, prevents reduction, increases wine volume and favors color stability.	100-200 g/hL
1/2 Fermentation	Yeast Protection	<b>Nutriform No Stop</b> : Purified yeast cell walls rich in fatty acids and sterols to improve yeast cell membrane fluidity, yeast resistance and fermentation activity. Highly recommended in high temperature fermentations.	200 g/hL
<i>Recommended analysis: Alcohol, Residual Sugar, pH, TA, Malic Acid, Microscan Press early and rack from heavy fermentation lees toward the end of the fermentation</i>			
Malolactic Fermentation	ML Nutrient	<b>Osmobacti</b> : Regulator of osmotic pressure and activator of ML fermentation. Increases survival rate of ML bacteria and helps them adapt to difficult conditions.	2 g/hL
	ML Bacteria	<b>Enartis ML Silver</b> : <i>Oenococcus oeni</i> that insures ML fermentation under difficult conditions due to high alcohol and polyphenol content.	
	Polysaccharides	<b>Enartis Surli One</b> : Contributes to protein, tartrate and polyphenol stability. Enhances volume and aromatic complexity.	20 g/hL
<i>Recommended analysis: Alcohol, Residual Sugar, pH, TA, Malic Acid, Microscan Rack from lees + add 5 g/hL Enartis Stab Micro M + SO<sub>2</sub></i>			

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