

WINE WITH LOW OR ZERO SO₂ ADDITION?

SO₂ alternatives

SO₂ is one of the most controversial additives currently used in the wine industry. Numerous attempts have been made to find alternatives as effective and healthy for human consumption. With the recent approval of products such as chitosan and PVI/PVP, it is now easier to replace sulphur dioxide.

SO₂ performs antioxidant, antioxidasic and antimicrobial activities but Enartis can give you a series of product alternatives to give the same benefits whilst producing low or SO₂-free wines.

ALTERNATIVES TO SO₂ FOR THE ANTIOXIDANT ACTIVITY

Wine oxidation is a complex mechanism that starts with oxygen dissolution, activation of oxygen into free radicals by copper and iron, oxidation of wine compounds (polyphenols, ethanol, aromatic compounds, etc.) by action of free radicals. Tannins, glutathione, ascorbic acid, citric acid, activated chitosan, pea protein and co-polymers of vinylimidazole and vinylpyrrolidone (PVI/PVP) can block this chain of chemical reactions and avoid wine oxidation.

ALTERNATIVES TO SO₂ FOR THE ANTIOXIDASIC ACTIVITY

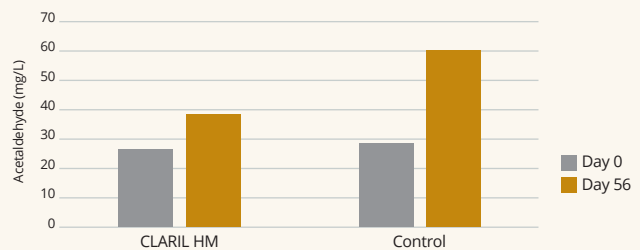
Juice oxidation is caused by enzymatic reactions. Tyrosinase in healthy grapes and laccase produced by *Botrytis*, in presence of oxygen turn polyphenols into quinones, strong oxidants responsible for juice browning. Copper is an element necessary for the activity of these enzymes.

PVI/PVP and activated chitosan can reduce polyphenol oxidase activity by removing copper.

ALTERNATIVES TO SO₂ FOR THE ANTIMICROBIAL ACTIVITY

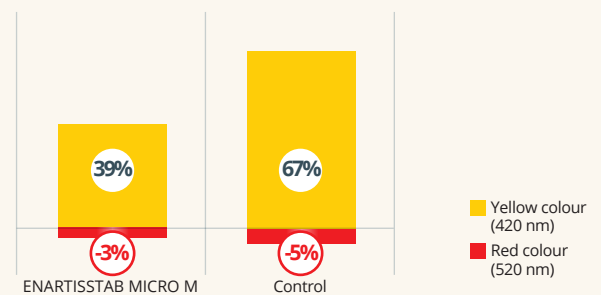
Activated chitosan is an antimicrobial fining agent that can be used during the entire vinification process to control spoilage microorganisms. Contrary to SO₂, activated chitosan is an allergen-free substance and its antimicrobial activity is not really influenced by wine or juice pH. It can be used to control non-*Saccharomyces* yeast, bacteria and moulds, including *Botrytis* and its spores.

CLARIL HM reduces the increase of acetaldehyde



Bottled white wine stored for four weeks in stressful conditions. Analytical control was done at the time of bottling and after 8 weeks. The wine treated with CLARIL HM shows an increase of acetaldehyde significantly lower than the control.

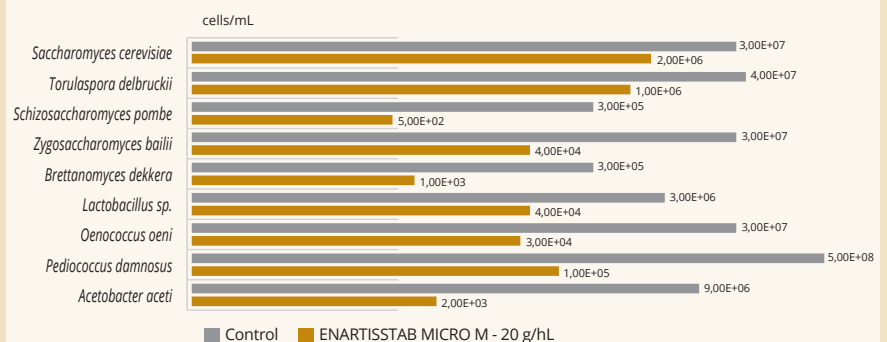
ENARTISSTAB MICRO M reduces the effect of laccase



Colour difference pre- and 4 hours post- laccase addition

ENARTISSTAB MICRO M

EnartisStab Micro M is effective in controlling the main spoilage microbes without affecting the fermentation of *Torulaspora* and *Saccharomyces*



WHITE AND ROSÉ VINIFICATION

VINIFICATION PHASE	PRODUCT	COMPOSITION	ACTIONS
GRAPES AND MUSTS	EnartisTan Arom	Gallic and digallic tannin + yeast derivative with sulphur amino acids	<ul style="list-style-type: none"> Reduction of dissolved oxygen Blocks the radicals
	Protomix AF	Bentonite, PVPP, pea protein, cellulose	<ul style="list-style-type: none"> Removal of catechins Removal of iron
	EnartisStab Micro M	Activated chitosan	<ul style="list-style-type: none"> Removal of spoilage microbes Removal of catechins Removal of iron and copper Reduction of laccase and tyrosinase activity
FERMENTATION	EnartisPro FT	EnartisPro FT: Inactivated yeast rich in sulphur amino acids and mannoproteins + PVI/PVP	<ul style="list-style-type: none"> Removal of copper and iron Removal of catechins Reduction of laccase and tyrosinase activity
	Q9 or ES 181	Selected dry yeast	<ul style="list-style-type: none"> Low SO₂-producing yeast strains
WINE MATURATION	Surli One and EnartisStab SLI	Surli One: Inactivated yeast EnartisStab SLI: Inactivated yeast + PVPP + oak tannin	<ul style="list-style-type: none"> Reduction of dissolved oxygen Removal of catechins Stabilisation of wine redox potential
	Claril HM	PVI/PVP, activated chitosan	<ul style="list-style-type: none"> Removal of iron and copper Removal of catechins
	Combistab AF	PVPP, pea protein, silica	<ul style="list-style-type: none"> Removal of catechins Removal of iron
	EnartisTan SLI	Ellagic tannin from untoasted American oak	<ul style="list-style-type: none"> Reduction of dissolved oxygen Stabilisation of wine redox potential
	EnartisStab Micro M	Activated chitosan	<ul style="list-style-type: none"> Removal of spoilage microbes Removal of catechins Removal of iron and copper
	EnartisTan SLI	Ellagic tannin from untoasted American oak	<ul style="list-style-type: none"> Removal of dissolved oxygen
BOTTLING	Citrostab rH	KPS, ascorbic acid, citric acid, gallic tannin	<ul style="list-style-type: none"> Reduction of dissolved oxygen Prevention of pinking

RED VINIFICATION

VINIFICATION PHASE	PRODUCT	COMPOSITION	EFFECTS
GRAPES AND MUSTS	EnartisTan Rouge	Condensed tannin, chestnut tannin and gallic tannin	<ul style="list-style-type: none"> Reduction of dissolved oxygen Blocks the radicals
	EnartisStab Micro M	Activated chitosan	<ul style="list-style-type: none"> Removal of spoilage microbes Removal of catechins Removal of iron and copper Reduction of laccase and tyrosinase activity
FERMENTATION	ES 488 or WS	Selected dry yeast	<ul style="list-style-type: none"> Low SO₂-producing yeast strains
WINE MATURATION	Surli One and EnartisStab SLI	Surli One: Inactivated yeast EnartisStab SLI: Inactivated yeast + PVPP + oak tannin	<ul style="list-style-type: none"> Removal of dissolved oxygen Removal of catechins Stabilisation of wine redox potential
	Claril HM	PVI/PVP, activated chitosan	<ul style="list-style-type: none"> Removal of iron and copper Removal of catechins
	EnartisTan SLI	Ellagic tannin from untoasted American oak	<ul style="list-style-type: none"> Reduction of dissolved oxygen Stabilisation of wine redox potential
	EnartisStab Micro M	Activated chitosan	<ul style="list-style-type: none"> Removal of spoilage microbes Removal of catechins Removal of iron and copper
BOTTLING	EnartisTan SLI	Ellagic tannin from untoasted American oak	<ul style="list-style-type: none"> Removal of dissolved oxygen
	Citrostab rH	KPS, ascorbic acid, citric acid, gallic tannin	<ul style="list-style-type: none"> Reduction of dissolved oxygen



Inspiring innovation.

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