

IT'S TIME FOR ANIMAL-FREE FINING AGENTS!

Organic and vegan wine production has been growing exponentially in recent years due to consumer demand for natural wines, which are free of allergens, proteins of animal origin and/or SO₂.

For this reason, Enartis has focused on the development of products of natural, vegetal and microbiological origins which produce high-quality wines that are no less traditional than wines produced using SO₂ and animal protein-based fining agents. Chitosan can be used to replace or reduce the use of SO₂ for microbiological and antioxidant control while plant protein-based fining agents remove undesirable compounds that can interfere with the quality and shelf life of wine.

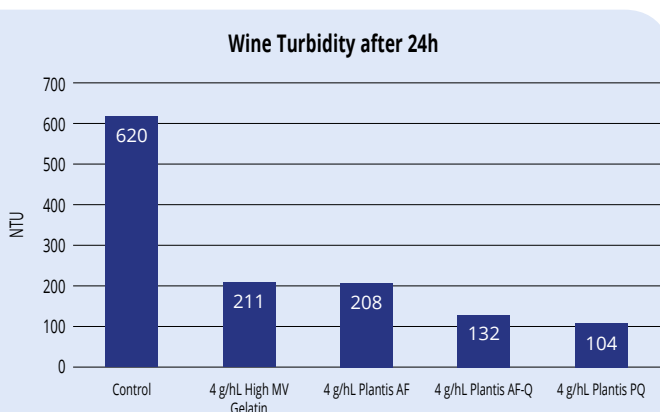
FINING AGENTS

Enartis has developed a range of plant-based adjuvants based on pea and potato proteins which allow for the replacement of proteins of animal origin, obtaining comparable results in terms of fast and effective wine clarification, reduction of oxidized or easily oxidizable polyphenols, catalyst metals of oxidation reactions and, consequently, a reduction of oxidized color (OD 420 nm). Research and development found that a specialized chitosan combined with plant proteins helped to improve flocculation speed and fining action.

This leads to sensory improvement and better shelf life.

1. Effect on wine clarification

One of the main purposes of fining is to improve wine clarity by removing unwanted compounds. Until now, the most effective fining agents have been gelatin (especially high molecular weight (MW) gelatins), isinglass, and egg albumen. Due to the current objection by some consumers to the use of allergenic products of animal origin, it has been observed that plant-based fining agents can achieve similar and comparative results (Graph 1).



Graph 1. Turbid red wine fining. The combination and activation of plant proteins and chitosan helps obtain lower turbidity.

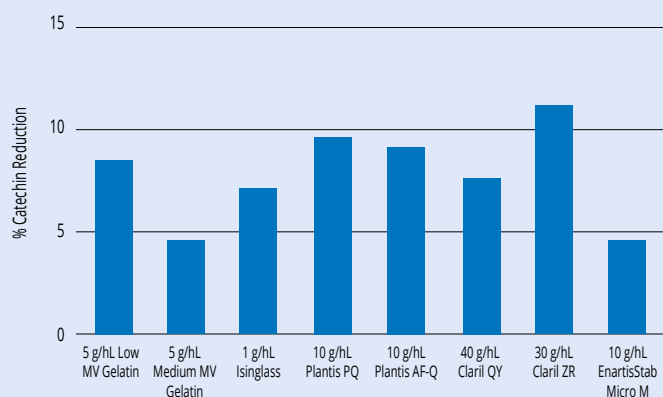
2. Effect on oxidized compounds

To obtain fresher wine, stable aromas and color over time, it is necessary to reduce oxidized and oxidizable polyphenolic compounds which are directly involved with oxidation reactions, causing darkening of color and the appearance of flatness and bitter flavors, consequently, spoiling final quality.

To significantly reduce hydroxycinnamic acids and low molecular weight catechins, it is necessary to use polyvinylpolypyrrolidone (PVPP) or carbon even though their use has a sensory impact, especially carbon. 20 g/hL of PVPP can reduce around 30-40% catechin content and carbon around 30%. The reduction always depends on the catechin concentration.

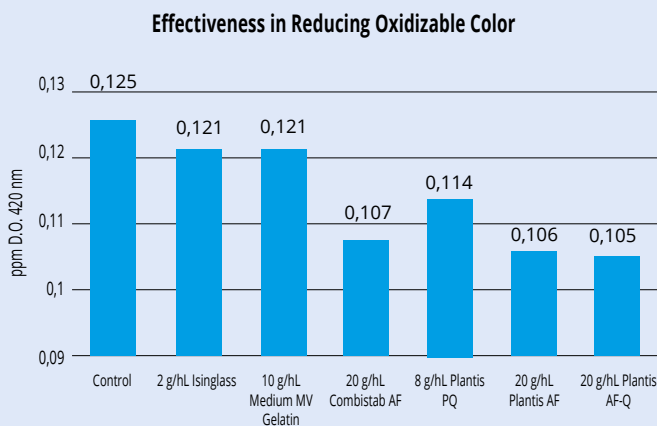
As a vegan and organic alternative, the following fining agents can be used (Graph 2) to help reduce the catechin concentration although it is not very significant. More alternatives are being studied.

Effectiveness of Vegetable Fining Agents in the Reduction of Catechins



Graph 2. White wine fining with 85 ppm initial catechin content. The use of Enartis allergen-free fining agents obtains similar results to those expected from a low molecular weight gelatin.

Optical density at 420 nm is widely used in white wines to determine the degree of sensitivity to oxidation and understand the oxidation potential of a wine. If the 420 nm increases, it means more oxidized compounds are present. To reduce this optical density, pea protein has been found to be much more effective than other plant proteins or even animal-origin proteins (Graph 3).

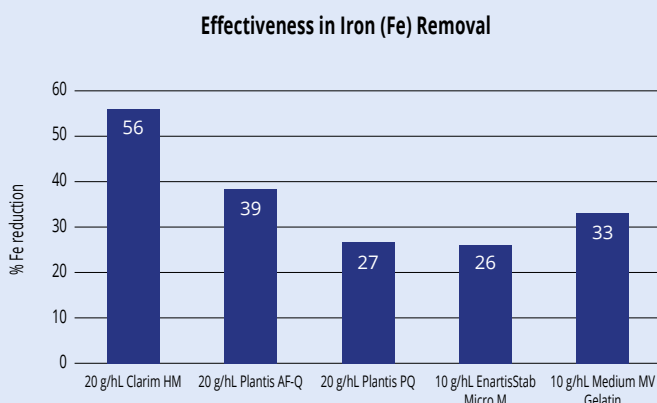


Graph 3. White wine with high oxidation potential: 1.7 ppm copper and 7 ppm iron content.

3. Metal removal

Metals play a big role in wine oxidation. Many compounds are involved in wine oxidation, but iron and copper are catalysts that convert oxygen into free radicals causing haziness, browning, loss of aromatics, increase of acetaldehyde and reduced wine shelf life.

The most effective compounds for absorbing these pro-oxidant metals and limiting the oxidation process are the copolymers of polyvinylimidazole and polyvinylpyrrolidone (PVI/PVP). As a natural alternative, plant proteins and activated chitosan are effective in mainly removing iron (Graph 4).



Graph 4. Red wine with approximately 5 ppm initial iron content. Pea protein is most effective in removing iron whilst chitosan has a positive effect on iron removal.

On the other hand, to significantly reduce the copper content, PVI/PVP is the most effective after alcoholic fermentation. It has been observed that the greatest reduction in copper occurs during fermentation, depending on yeast and its capacity to absorb it. The use of inactive yeast during wine

ageing has shown to be a good alternative to PVI/PVP. Surli One (40 g/hL) after 1-2 weeks of "batonnage" can reduce up to 40% of copper.

4. Effect on sensory quality

Taking into consideration all the positive benefits of using plant-based fining agents, it leads to an overall improvement in the sensory properties of wine.

WHITE WINE: TREBBIANO

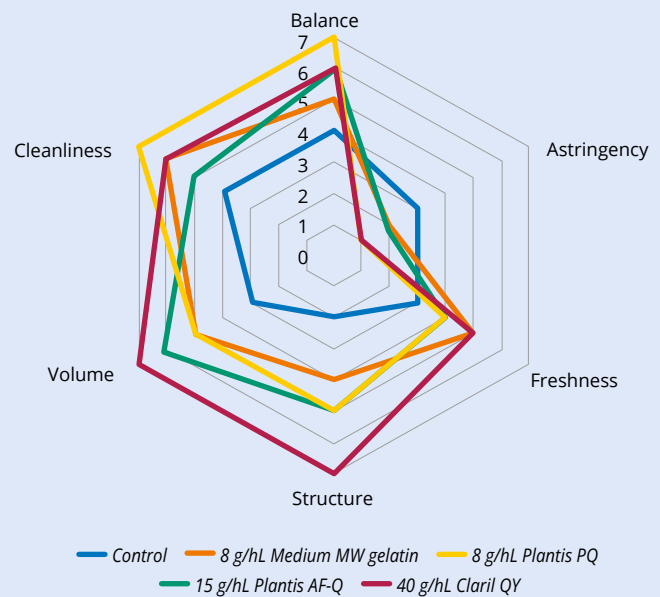


Fig. 1. Blind tasting of white wine. All treatments improved wine quality. Alternatives to animal-origin proteins had overall better results in terms of balance, cleanliness, volume and structure.

RED WINE: SANGIOVESE

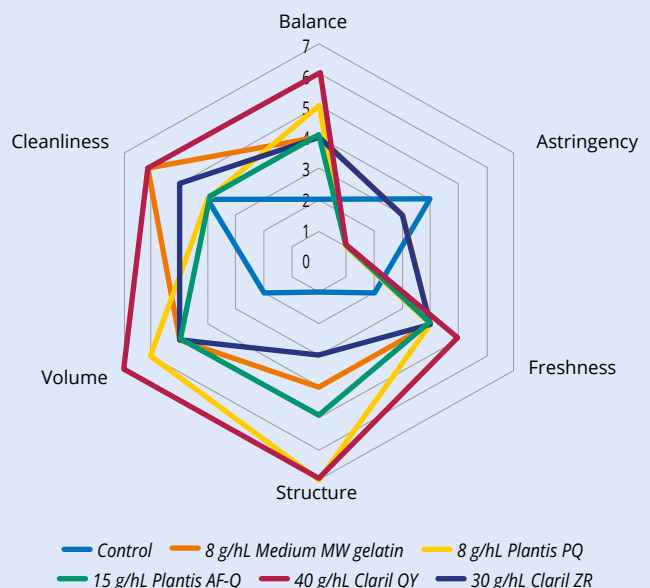


Fig. 2. Blind tasting of red wine. All treatments improved wine quality. Alternatives to animal-origin proteins had overall better results in terms of balance, volume and structure.

ACTIVATED CHITOSAN APPLICATIONS

Chitosan is known for its powerful antimicrobial activity to control the development of numerous microorganisms during different stages of vinification.

Enartis has developed EnartisStab Micro M, an allergen-free, vegan-friendly bioregulator containing activated chitosan and yeast hulls rich in chitin-glucan. It is not only effective for the control of undesirable microorganisms, but due to its production process, it also has clarifying and antioxidative actions. Therefore, EnartisStab Micro M can be used for the following winemaking applications:

- Control juice contaminants. Its application is strongly recommended on damaged grapes or grapes affected by molds such as *Botrytis cinerea* (to limit laccase activity).

- Limit oxidation reactions due to its capability of chelating metals such as copper and iron.
- Promote the dominance of the selected yeast. In spontaneous fermentations, it helps to control the development of native yeast.
- Prevent stuck or sluggish fermentations.
- Delay or avoid malolactic fermentation.
- Prevent the formation of reductive compounds such as H_2S .
- Aid in juice and wine clarification.
- Reduce or eliminate the use of SO_2 .

CONCLUSIONS

Depending on the enological objective:

ENOLOGICAL OBJECTIVE		TRADITIONAL FINING AGENTS	ALLERGEN-FREE FINING AGENTS
CLARIFICATION		<ul style="list-style-type: none"> • Isinglass • Egg albumen • Gelatin 	<ul style="list-style-type: none"> • CLARIL ZW • CLARIL HM • CLARIL AF
METAL REDUCTION	FE	<ul style="list-style-type: none"> • CLARIL HM (PVI/PVP) 	<ul style="list-style-type: none"> • PLANTIS AF • PLANTIS AF-Q
	CU		<ul style="list-style-type: none"> • SURLI ONE
420 nm REDUCTION		<ul style="list-style-type: none"> • ENOBLACK PF, ENOBLOCK PERLAGE (Carbon) • PVPP • Casein 	<ul style="list-style-type: none"> • PLANTIS AF • PLANTIS AF-L • PLANTIS AF-Q • CLARIL AF • COMBISTAB AF
TOTAL POLYPHENOL/CATECHIN REMOVAL		<ul style="list-style-type: none"> • PVPP • ENOBLACK PF, ENOBLOCK PERLAGE (Carbon) 	<ul style="list-style-type: none"> • PLANTIS AF-Q • CLARIL AF • COMBISTAB AF
ASTRINGENCY REDUCTION		<ul style="list-style-type: none"> • Egg albumen • Gelatin 	<ul style="list-style-type: none"> • CLARIL QY • SURLI RANGE • INCANTO NC RANGE
MICROBIOLOGICAL CONTROL		<ul style="list-style-type: none"> • SO_2 • SORBOSOL K (Potassium sorbate) 	<ul style="list-style-type: none"> • ENARTISSTAB MICRO M • HIDEKI

Products underlined in green in the column of Traditional Fining Agents are authorized organic, allergen-free and vegan; in red are allergen-free and vegan but they are not organic authorized; and in blue are allergen-free but not vegan or organic authorized.

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