PRACTICAL BOOKLET

TOOLS AND SOLUTIONS FOR MUST CLARIFICATION

This practical booklet aims to help practitioners to decide on their must and wine clarification. Our aim is to give each winemaker a solution that is adapted to their objectives and constraints.

MUST CLARIFICATION IS CRUCIAL FOR WINE PRODUCTION FOR MANY REASONS:

- Remove large residues (leaves, soil,…),
- Limiting the negative effects linked to faulty musts (botrytis, oidium…),
- Reduce the amount of oxidised and oxidisable polyphenols that are the source of wine oxidation and bitterness,
- Adjust musts' colour,
- Improve the aromas and avoid reductive and vegetal aromas,
- Increase the filterability and stability of future wines.

DECREASE VISCOSITY AND FACILITATE CLARIFICATION

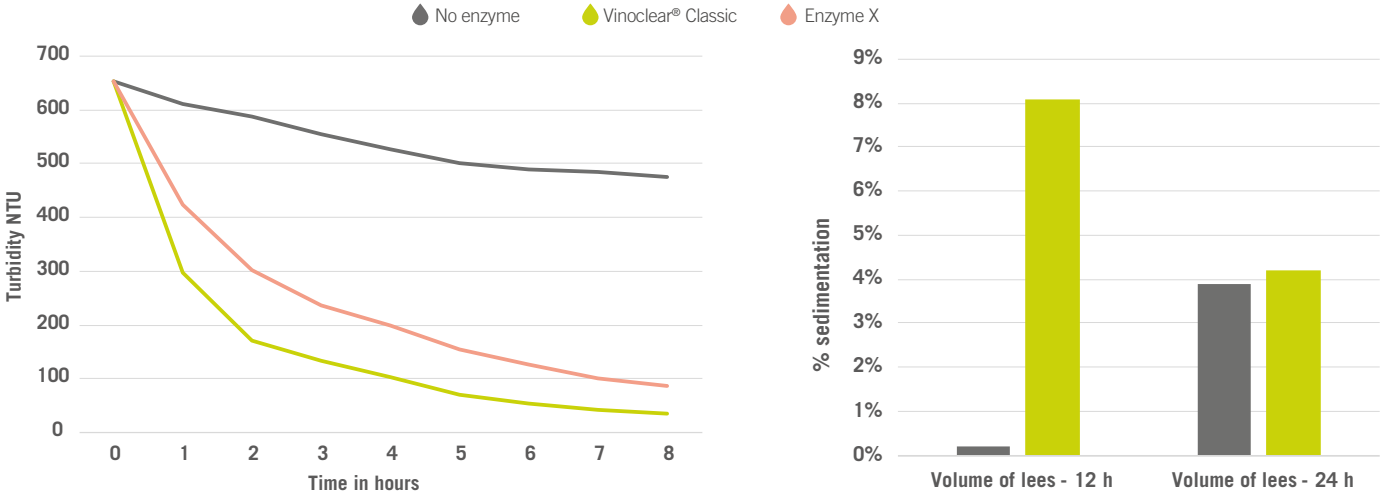
One of the main factors that can affect a good clarification is must viscosity. This viscosity comes mainly from the presence of pectins. As well as increasing viscosity, these compounds prevent heavier particles from sedimenting. Pectins crease a lattice which, like a fishing net, holds particles in suspension.

1. Effectively depectinize musts

Clarification enzymes are the only **effective and fast tool for depectinizing musts**. Their role is to cut the pectin chains into smaller pieces, thus decreasing the viscosity of the musts. Adding enzymes as early as possible on the grapes helps to quickly **decrease viscosity and helps particles aggregate whilst facilitating pressing,** thus giving shorter press cycles.

Effect on enzyme addition on the speed of clarification and sedimentation

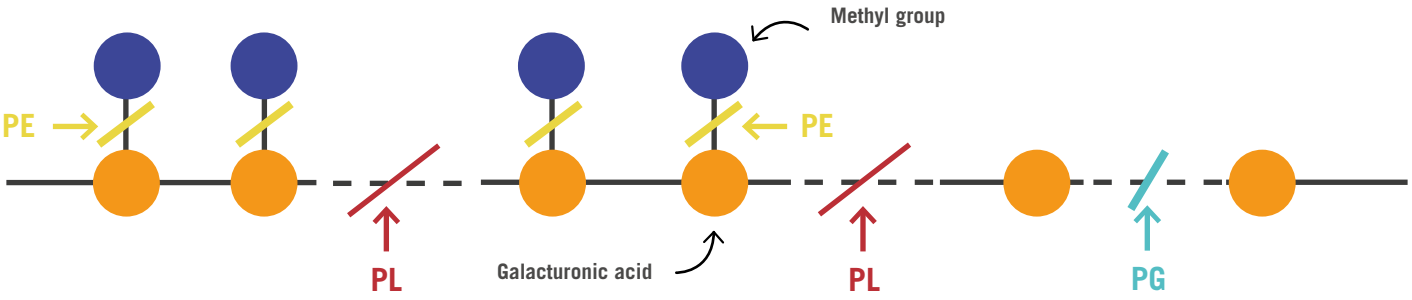
Trial on Chardonnay pH 3.3 – 16°C. The modality without enzymes remains very turbid after 12 hours



2. Better understand enzymes' mechanisms

There are three main pectinase activities (see diagram below):

- **Pectin lysases (PL) :** directly cut the pectin bonds between 2 esterified galacturonic acids. This is the fastest activity.
- **Pectin esterases (PE) :** de-esterify pectin and prepare PG activity.
- **Polygalacturonase (PG) :** cut the pectin bonds on de-esterified galacturonic acids.

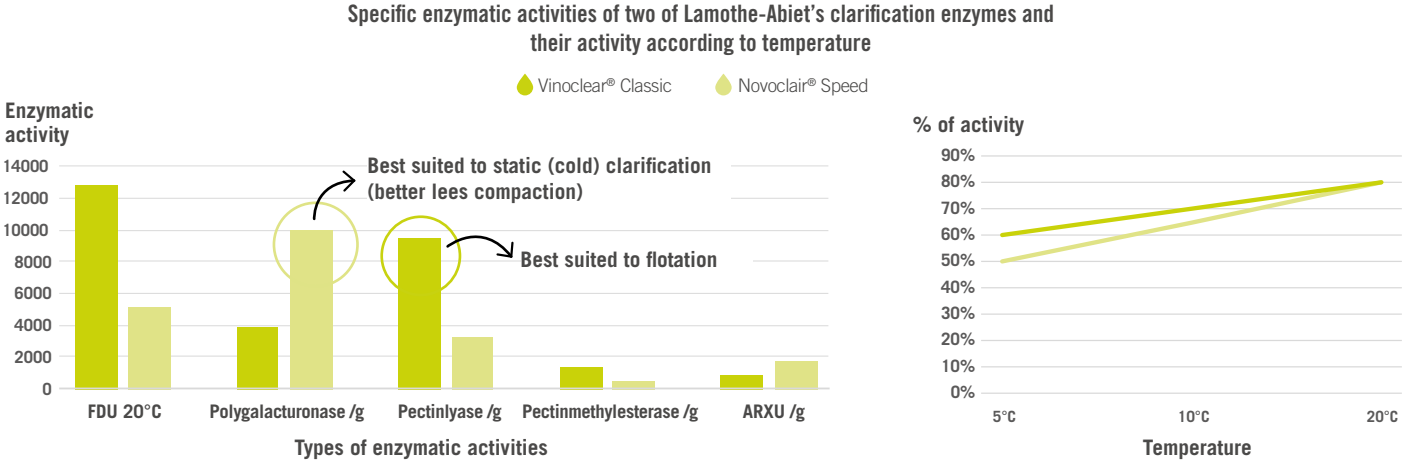


The benefits of using clarification enzymes:

- **Optimised depectinisation and clarification**
- **Optimised extraction of pulp during pressing**
- **Extraction of more beneficial compounds**
- **Better filterability and stability on the finished wines**
- **Save time and increase yields (especially in first press juice)**

3. L.A SOLUTIONS

Lamothe-Abiet has teamed up with Novozymes, the world leader in enzymes, to create specially formulated enzymes for fast and **efficient clarification of musts, even under difficult conditions of pH and low temperatures**.



Vinoclear® Classic Classic is an enzyme rich in pectin lyase. It cuts most of the primary pectin chain and is very effective for flotation.

Thanks to its high concentration in polygalacturonase, **Novoclair® Speed** mainly cuts the primary and secondary chains, resulting in less lees and good static (cold) clarification.

Furthermore, these two enzymes have a relatively high activity even under low temperatures (the residual activity of these enzymes at 5°C is around 50 to 60%).

IMPLEMENTATION: HOW TO ADJUST THE ENZYME DOSAGE?

The amount of enzymes to be added is a factor of several parameters:

- The grapes' maturity
- Health of the grapes
- Amount of physical extraction
- Clarification temperature

The alcohol pectin test indicates whether there are pectins that may adversely affect the clarification of the must. It is helpful to carry out this test on different musts in order to optimise the enzyme dosage.

4. In case of Botrytis

When the grapes are damaged by *Botrytis cinerea*, the fungus produces a high laccase activity (polyphenol oxidase) and a large amount of glucans. These highly clogging polysaccharides **must be removed quickly as they inhibit clarification**.

It is therefore useful to add a **specific enzyme to remove both pectins and glucans**, rather than a classic pectinase. **Vinotaste® Pro** has been specifically made to solve this type of problem.

CHOOSING THE BEST SUITED FINING

1. Definition

Fining involves adding a substance called a fining agent to more or less stable musts or wines. These fining agents are able to react with the unstable compounds and/or reagents, flocculating then sedimenting, bringing with it the fine particles in suspension. **The success of fining depends on the right choice of product and correct usage.**

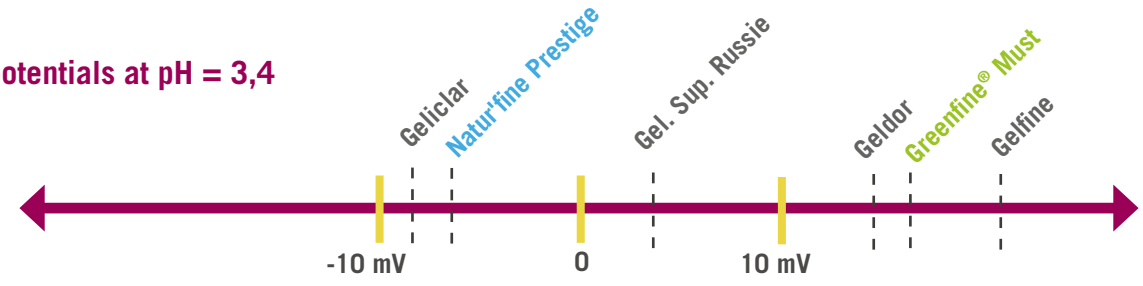
2. Effectiveness of different fining agents

The capacity of a fining agent to clarify a must depends on their **quality** but also the **conditions such as pH**. The zeta potential of a fining agent is a good indicator of its ability to clarify a must. Its value depends partly on the must's pH.

The higher the absolute value of the fining agent, the **faster it gives clarification and sedimentation**, and the greater the amount of lees formed. On the other hand, if a fining agent has a low absolute value, it will give a **slower clarification and sedimentation, but will form fewer lees**.

Here is a comparison at low pH for different fining agents from the Lamothe-Abiet range:

Zeta potentials at pH = 3,4

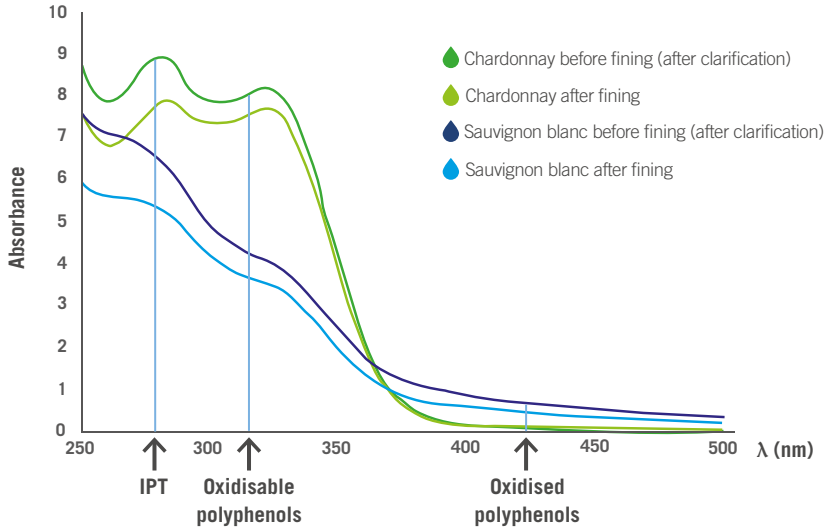


3. Pea proteins

Phenolic acids are compounds naturally found in grapes, their concentrations varying according to the grapes' maturity and the amount of physical extraction during transport and pressing. These compounds are extremely oxidisable and, in the presence of oxygen, form quinones which can oxidise aromatic precursors, give bitterness, and change the colour (yellow orange tints). **It is therefore very important to remove these components before the fermentations begin.**

The use of a pea protein specially selected by Lamothe-Abiet allows these polyphenols to be removed as effectively as using casein or PVPP.

Comparative trial of treatments on the decrease in total phenolic compounds and phenolic acids (oxidisable compounds) and yellow colour compounds



4. The Greenfine® range: fining solutions using pea proteins

With evolving consumer demands and enological practices, we can see an exponential increase in organic wine production across the globe. It is essential to follow this trend and to offer a range of highly customised products to winemakers.

Lamothe-Abiet has developed a**lternatives that can be used in organic winemaking** (EU and NOP), using **natural, allergen-free and vegan** raw materials to best face the current issues for producers and consumers. As well as following the market's demands, it is essential that these tools meet the highest requirements in terms of effectiveness and quality.

FINING PRODUCTS BASED ON PEA PROTEINS		STRUCTURE	COLOR STABILITY	DECREASE VEGETAL	REMEDY OXIDATION	TYPE OF WINE / APPLICATION	DOSAGE*
GreenFine® Nature (Pea proteins, inactivated yeasts, calcium bentonite)		•	••	•••	•••	Must / Wine	10-80 g/hL
GreenFine® Must **Greenfine® Must L**: liquid (Pea proteins)		•	•	•••	•••	Must / Flotation	10-50 g/hL L: 10-50 cL/hL
GreenFine® Rosé (Pea proteins, PVPP)	P	•	••	•••	•••		10-80 g/hL
GreenFine® X-PRESS (Pea proteins, PVPP, calcium bentonite, Chitin-Glucan)		••	••	••	••	Must / Flotation	10-100 g/hL
GreenFine® Intense (Pea proteins, discolouring activated carbon, PVPP, calcium bentonite)			•••	••	••		10-120 g/hL

P : powder

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