TOOLS FOR ACIDIFICATION IN MUSTS AND WINES

Three acids are authorised for acidifying musts and wines:

- Tartaric acid (L(+) tartaric).
- Malic acid (L-Malic – D,L-Malic).
- Lactic acid (DL- Lactic).

These acids are naturally present in grapes. They differ in structure, acidification capacity and organoleptic impact. Operations can consist of a mix of additions of different acids (especially appropriate on wines for organoleptic purposes).

The goals pursued must be the object of prior testing. Variations in pH and total acidity for the same treatment are not the same, the ionic strength and the buffering capacities can have a significant influence from one must or wine to another.

REGULATORY STANDPOINT

EC regulation 606/2009 (Appendix IA, point 12) allows the possibility of using tartaric acid, malic acid and lactic acid for acidification purpose in musts and wines.

Acidification of musts and new wines in fermentation:

Maximum dosage 1.5 g/L expressed in tartaric acid i.e. 20 meq/L (1.0 g/L expressed in H_2SO_4). Treatment in one single operation.

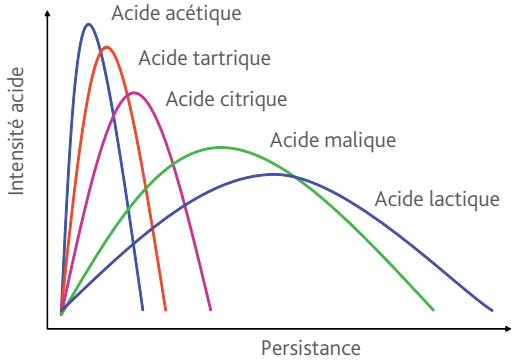
Acidification of wines:

Maximum dosage 2.5 g/L expressed in tartaric acid i.e. 33.3 meq/L (1.6 g/L expressed in H_2SO_4). Treatment in several operations within the legal limit, solely on the site of the vinification company and in the wine growing zone where the grapes involved in making the wine in question have been harvested.

All treatments will be entered into a handling register and a custody register.

Acidification and enrichment (or chaptalisation) of one and **the same product are mutually exclusive processes** (for example a must or new wine still in fermentation can be enriched or chaptalised and the wine from the fermentation can be acidified), except by way of derogation (Appendix V § C point 7).

Acidification des moûts et des vins



Lactic: soft, balanced
Tartaric: lively, immediate
Malic: sharp, less immediate

Below, a summary of the commercial products available and their principal oenological characteristics.

	Tartaric acid	Malic acid	Lactic acid	Comments
Chemical formula	$CH_4H_6O_6$ E334 L	$CH_4H_6O_6$ E296 DL/L	$CH_4H_6O_6$ E270 DL	Malic and lactic acids are achiral molecules. They exist in the form of two enantiomers: L and D form. Only the L form of malic acid exists naturally in grapes. Lactic acid is a natural result of lactic bacteria metabolism produced by the latter only in the L form when they consume malic acid, and in a mix of L and D form when they consume sugars.
pKa	3.05 / 4.2 Di-acid	3.4 / 5.1 Di-acid	3.85 Mono-acid	The acids are classified according to their pKa (acidity constant). The higher the pKa, the weaker the acid.
Correspondence 1 Eq.	75 g	67 g	90 g	
Recommended targets	Red – Rosé White	White – Rosé	Red – Rosé White	
Treatment on must (at 20 meq/L)	1.50 g/L	1.34 g/L	1.80 g/L	
Treatment on wine (at 33 meq/L)	2.5 g/L	2.23 g/L	3.00 g/L	
Effect on pH	+++	++	+	Tartaric acid remains the most effective on pH. To avoid an excessive precipitation of salts, it is recommended to use it during fermentation on must.
Effect on total acidity	++	+++	+++	
Chemical stability	- (potassium bitartrate precipitation)	+++	+++	Potassium or calcium salts from malic and lactic acids are significantly more soluble than tartaric acid salts, the risk of precipitation is thus lower.
Microbiological stability	+ Only risk is acetic acid degradation (tourne disease) by certain lactic bacteria	--- During MLF the L form of malic acid is consumed by the lactic bacteria	-	Malic and lactic acids interact with the bacteria metabolisms. However, increased control over MLF (usage of selected bacterial starters) and good hygiene regulations significantly reduce the risks of alterations.
Organoleptic impact	Lively. immediate. dryness. hardness.	Freshness. greenness (green apple).	Soft and tart acidity.	
Formulation	Powder	Powder	Liquid	Lactic acid is in liquid form, powder formulations contain unauthorised lactates. Powders can be directly dissolved into the wine.

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