

MLF: Minimisation of unwanted malolactic fermentation in sparkling wine

Summary

The main objective of the project was to avoid undesired malolactic fermentation (MLF) in sparkling wines and find a procedure to minimise its occurrence. Malolactic fermentation (MLF) is the conversion of L-malic acid to L-lactic acid by lactic acid bacteria (LAB), such as *Oenococcus oeni*. In many wines, especially red wines, this process is carried out either spontaneously or by inoculating starter cultures to reduce acidity and improve the organoleptic qualities. However, in most cava-type sparkling wines, MLF is unwanted because the level of L-malic acid is not very high and it does not reduce the organoleptically desired acidity in this type of wine. Thus, the appearance of MLF in sparkling wines is considered a defect which also causes significant financial losses for the winery, as the product has to be discarded.

Objectives

The project aims to prevent the occurrence of undesirable malolactic fermentation (MLF) in sparkling wines and test possible preventions to minimise its occurrence. In order to achieve this objective, the purpose of this pilot test is to obtain a new, currently non-existent procedure to prevent the development of undesirable MLF in sparkling wines.

Description of the actions carried out in the project

During the project, work was carried out on assessing treatments that inhibit malolactic fermentation.

1. Assessment of the effect of chitosan and potentially inhibitory yeasts on MLF

In autumn 2018, vinifications were carried out using Parellada grape must provided by the participating wineries to assess the inhibitory effect of chitosan (20g/hL) and two yeasts on MLF. The vinifications were carried out in the Rovira i Virgili University experimental winery Mas dels Frares (Constantí, Tarragona) using full-scale cava production conditions (volumes, fermenters, tirage and ageing).

2. Assessment of the effect of fumaric acid and chitosan on MLF

In the 2019 harvest, must from the Parellada variety was used to assess the effect of fumaric acid (30 g/hL) and chitosan (20 g/L). The trials were carried out at the Mas dels Frares winery.

3. Assessment of the effect of fumaric acid and chitosan on tirage

A trial involving the addition of fumaric acid (30 g/hL), chitosan (20 g/hL) before tirage and a control condition without addition was carried out using base white wine from the 2019 vintage to assess the inhibitory effect of these compounds on wines that had been inoculated with strain CVP4.6 *O. oeni*, isolated from cava, in populations of 0, 10², 10⁴ and 10⁶ CFU/mL, emulating different degrees of LAB contamination in wine. Thus, a total of 12 conditions, tested in triplicate, were assessed. The trials were carried out at the Mas dels Frares winery.

4. Confirmation of the effectiveness of fumaric acid as an MLF inhibitor treatment

In autumn 2020, the trial was repeated using Parellada grape must, after being cut short due to lock-down. This trial may be considered the definitive pilot test to confirm the effectiveness of fumaric acid as a suitable treatment for MLF inhibition in cava.

Final results and practical recommendations

Characterisation of strains isolated from cava:

Some of the *O. oeni* strains isolated from cava have been characterised by their tolerance to the inhibitory treatments assessed in the project: the addition of fumaric acid and chitosan. A comparison of strains isolated from cava with strains used as MLF starter cultures in still wines found that the former show higher resistance to chitosan but are sensitive to treatment with fumaric acid.

Conclusions

Summarising the previous sections, the main conclusions reached in the project are:

- Lactic bacteria are found from the first stages of the cava production process onwards.
- Fumaric acid is confirmed as the best treatment to prevent MLF, both before and after FA and during tirage.
- There is no negative effect on effervescence from fumaric acid treatment, nor on the organoleptic characteristics of the wine.
- *Oenococcus oeni* strains isolated from cava show more resistance to some treatments, such as SO₂ and chitosan, than other strains isolated from wine. Fumaric acid is however effective in inhibiting MLF in cava isolates.

Leader of the Operational Group

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Subject area(s) of application

- Agricultural production system
- Agricultural practice
- Agricultural equipment and machinery
- Livestock farming and animal welfare
- Vegetable production and horticulture
- Landscape / Territorial management
- Pest and disease control
- Fertilisation and nutrient management
- Soil management
- Genetic resources

<input type="checkbox"/>	Forestry
<input type="checkbox"/>	Water management
<input type="checkbox"/>	Climate and Climate Change
<input type="checkbox"/>	Energy management
<input type="checkbox"/>	Waste and by-product management
<input type="checkbox"/>	Biodiversity and environmental management
<input checked="" type="checkbox"/>	Food quality/processing and nutrition
<input checked="" type="checkbox"/>	Supply chain, marketing and consumption
<input type="checkbox"/>	Competitiveness and agricultural and forestry diversification
<input type="checkbox"/>	General

Geographical area(s) of application

PROVINCE(S)	REGION(S)
BARCELONA, GIRONA	ALT EMPORDÀ, ALT PENEDEÈS, ANOIA

Dissemination of the project (publications, conferences, multimedia, etc.)

The project was presented at an INNOVI project presentation conference.

Project website

<https://www.innovi.cat/fml/>

More information on the project

PROJECT DATES	TOTAL BUDGET	
Start date (month-year): October 2018	Total budget	€211,997.16
Completion date (month-year): May 2021	DACC funding	€120,838.38
Current status: Executed	EU funding	€91,158.78
	Own funding	€63,599.15

With funding from:

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