Why use **Bioprotection** during winemaking?

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What is Bioprotection?

Bioprotection refers to **the use of natural products to control pests** and **diseases**.

This approach has gained significant interest globally, particularly in the wine industry, due to **increasing consumer demand for preservative-free** and **allergen-free wines**.

Bioprotection in winemaking aims to **enhance wine quality by minimising or eliminating chemical additives,** and naturally inhibiting unwanted micro-organisms found on grapes or in the must.

How does bioprotection work?

Bioprotection works by **introducing living micro-organisms or their purified metabolites** during food production. These micro-organisms prevent spoilage through passive strategies like competition for space, nutrients, and oxygen, and active strategies like producing antimicrobial molecules.

The selected bioprotector should inhibit unwanted microbial growth **without negatively affecting the composition of the grapes or must**.

How is it applied in the wine industry?

In winemaking, **sulphur dioxide (SO_2) is commonly used to control unwanted micro-organisms due to its cost-effectiveness and antimicrobial properties**.

SO_2

However, it's an allergen and can cause health issues, especially in sensitive individuals. Therefore, organisations like the World Health Organisation and the International Organisation of Vine and Wine **advocate for alternatives to reduce or eliminate its use**. The European Community also mandates specific labelling for products containing SO_2.

Examples of effective bioprotectors on following page...

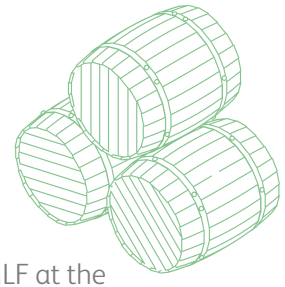
Some physical treatments to reduce SO_2:

- High pressure
- High power ultrasonics
- Ultraviolet radiation
- Pulsed electric field

Some Chemical treatments to reduce SO_2:

- Bacteriocins
- Combination of lysozyme with tannins
- Dimethyl dicarbonate (DMDC)
- Colloidal silver complex

Some examples of biological control:



Lactobacillus plantarum can be used to perform the MLF at the same time as alcoholic fermentation (AF) is carried out. These bacteria would inhibit the growth of acetic acid bacteria and therefore reduce the risk of volatile acidity production.

Several studies have also identified **two oenologically derived *non-saccharomyces* yeast strains as effective bioprotectors:**

1 ***TORULASPORA DELBRUECKII***

2 ***METSCHNIKOWIA PULCHERRIMA***

In summary: Why use Bioprotection?

- Bioprotection uses natural products to control pests and diseases.
- It introduces living micro-organisms during food production to prevent spoilage.
- Bioprotection offers an alternative to sulphur dioxide (SO_2), a common but potentially harmful antimicrobial agent in winemaking.
- Various bacteria and yeast strains can be used for biological control.
- They have minor and often advantageous effects on the composition of grapes or must, enhancing wine aroma and colour.

Why are these *non-saccharomyces* strains ideal for oenological bioprotection?

- *Metschnikowia pulcherrima* produces a naturally occurring antimicrobial compound, pulcherrimic acid, which inhibits the growth of various undesirable micro-organisms, such as *Brettanomyces bruxellensis* and *Botrytis cinerea*.
- *M. pulcherrima* scavenge iron which is an essential growth factor for other micro-organisms.
- Both *T. delbrueckii* and *M. pulcherrima* tolerate cold conditions well and are thus suitable for use during cold maceration and cold storage in the pre-fermentative stages.
- The bioprotective actions of both *T. delbrueckii* and *M. pulcherrima* do not affect *S. cerevisiae* activity under normal conditions.

These selected strains have **minor effects on the composition of the grapes or must** and the **effects reported are considered to be more advantageous** than disadvantageous:

- *T. delbrueckii* has been associated with the **production of thiol compounds** when inoculated sequentially.
- *M. pulcherrima* is known to have high beta-glucosidase activity and ester production and may therefore have a **positive impact on wine aroma**.
- *M. pulcherrima* wines usually have more dark fruit and **may retain more colour in the final wine**.

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