HPP TECHNOLOGY TO REDUCE SO_2 REQUIREMENTS

THE EFFECT ON SAUVIGNON BLANC COMPOSITION

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The quality and safety of food products are some of the most important factors influencing consumer choices in modern times. Consumers demand high-quality foods to be additive free, fresh in flavour, microbiologically safe, and with extended shelf life.

The emergence of high hydrostatic pressure (HPP) (also known as high pressure processing) is a game-changer for the food and beverage industry and is gaining rapid momentum worldwide. Commercial use of HPP has been accepted in many countries and it is possible to find and buy products treated by HPP such as meat products, seafood and fruit juices.

WHAT IS HPP?

HPP is is a cold pasteurization technique by which products, already sealed in its final package, are introduced into a vessel and subjected to a high level of isostatic pressure (usually 300 – 600 MPa) transmitted by water. It can thus serve as a **non-thermal alternative** to thermal pasteurization.

Pressures above 400 MPa at cold (4°C to 10°C) or ambient temperature **inactivate the yeasts, moulds, bacteria, virus and parasites** present in food, extending the products shelf life and guaranteeing food safety.

This technology offers several advantages compared to traditional food conservation hygiene methods[1,2] such as:

- **Inactivation of microorganisms and enzymes**
- Biopolymer modification
- **Quality retention (colour and flavour)**
- Changes in product functionality

This technology can be **valuable for the wine industry** in that wines can be **microbially stabilized after packaging**, thereby **reducing the need for preservation with SO_2** and possibly **bypass additional filtration processes**. Other than that, it could possibly serve as a safety net for wines at risk of refermentation. The fact that the technique is also applied at lower / ambient temperatures is of significant value due to the **preservation of wine constituents**, especially important aroma compounds.

TESTS DONE ON WINE?

Reports indicate that pressures between 300 - 500 MPa for 5 to 15 minutes can **inactivate bacteria and yeasts in red and white wines without causing significant sensory changes[1,3]**.

Sweet wines containing *Saccharomyces cerevisiae* yeast and/or lactic acid bacteria were successfully stabilised by HPP at 560-600 [4,5].

A need for more information regarding the effect of this technology on the chemical and sensory composition of young white wines sparked an investigation into the **effects of HPP on oenological and quality properties of a Sauvignon Blanc**[6]. Results were published in an article titled:

Oenological and Quality Characteristic on Young White Wines (Sauvignon Blanc): Effects of High Hydrostatic Pressure Processing

MATERIALS AND METHODS

A young Sauvignon Blanc from Casablanca Valley in Chile was used for the experiment. The packaged white wine (in plastic packaging – see comment in the conclusion section) was pressurized in a 2 L pressure unit. Water was used as a pressure-transmitting medium. The wine was treated at 300 MPa, 400 MPa, and 500 MPa for three different time intervals each: 5 minutes, 10 minutes and 15 minutes. Treatment was done at ambient temperature and results were compared to that of an untreated wine.
The wines were subjected to various chemical analyses as well as sensory evaluation using descriptive analysis.

RESULTS AND DISCUSSION

The treated wines (different pressures and holding time) exhibited physiochemical properties similar to the untreated wines. There were specifically **no significant changes in the pH, tartaric acid and residual sugar** content of the wine.

There was however a **significant difference in the alcohol and SO_2 content** of the wine. After treatment, the alcohol content of the treated wine ranged from 12.15 %v/v to 13.70 %v/v, while the control had an alcohol concentration of 10.48 % v/v. Interestingly, pressurization for 15 minutes increased the free and total SO_2 content of the wine with about 8-10 ppm on average (for all pressures tested). The author of the publication failed to provide clear reasons for these changes.

The higher pressure (500 MPa) treatments resulted in **higher turbidity** with the greatest ntu observed for the 500 MPa/15 minute treatment (34 ntu) compared to an average of 14 ntu (average of all the other pressures tested including the control). The author confirmed that the **increase in turbidity was due to residual pectin** that was not removed during the final filtration which then coagulated during the treatment.

Spectrophotometric measurements indicated changes in the “lightness” of the wine, with the control being lighter compared to the treated wine. However, these changes were only reported on a spectrophotometric level and **no visible changes** were detected by the sensory panel as the differences were too small to be able to differentiate visually.

Sensory analyses showed **no difference between the control samples and the samples pressurized at 300 MPa**. However, the sensory panel reported a **decrease in wine quality for the wines treated at 400 MPa and 500 MPa compared to the control**. The perception of fruity attributes in 400 MPa and 500 MPa was significantly lower compared to 300 MPa, while “odour defects” were evident in the higher pressure-treated wines. Other than the aromatic changes, the panel also reported an increased perception of astringency in the 500 MPa treated wine.

CONCLUSION

Overall, studies show that, **other than the inactivation of undesirable microorganisms, the Sauvignon Blanc wine composition largely remained unchanged when treated at 300 MPa**, resulting in a microbially stable product. These pressure levels are similar to the pressures used in commercial applications for fruit juice.

The technology can also be applied to the must/juice prior to fermentation to **eliminate wild yeast, thereby ensuring a controlled environment for the inoculation and growth of the desired yeast strain[7]**. The additional advantage for the application on juice prior to fermentation is the possible **inactivation of oxidation enzymes**.

This technique shows the **potential to decrease the required amount of SO_2 needed before bottling** to protect Sauvignon Blanc wine from microbial spoilage. Other than that, it also eliminates the need for any pasteurization treatments. This application could be especially valuable for products containing residual sugar and could be an alternative to the existing stabilization methods used in beer and wine industries. Originally, the technology was not suited for glass packaging, however, **new advances permit the use of glass bottles, metal cans and beverage cartons for high-pressure processing.**

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