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# FACTSHEET
# VOLATILE ACIDITY

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## VOLATILE ACIDITY

Volatile acidity (VA) is the measure of total steam distillable volatile acids, which almost entirely consists of acetic acid, along with other acids in lesser amounts.

Acetic acid is a critical parameter for the quality of fermented alcoholic beverages, such as wine and cider, as it is the main component of VA. After a certain limit of acetic acid concentration, the product suffers from an adverse organoleptic impact on the quality. This concentration limit varies depending on the type and style of the beverage produced. Above the specific limits, the product will show off-aromas of vinegar. Please note that there are specific products (such as sour cider or sour beer) which may show a higher concentration of volatile acidity as a stylistic approach.

## CAUSES OF VOLATILE ACIDITY INCREASE

There are different causes that contribute to excessive VA in the final product. The main causes can be listed as the health state of raw material, yeast activity during alcoholic fermentation, lactic acid bacteria activity during malolactic fermentation, and bacterial spoilage such as acetic acid spoilage or lactobacillus infection. Although acetic acid is mainly produced by yeast and bacterial metabolism, it can also be formed chemically during aging in oak.

Some of the possible causes of increased VA are as follows:

- Damaged raw fruits are prone to have microbial spoilage that can cause increased VA in the juice. Moreover, if the fruits are affected by the fungus, *Botrytis cinerea*, it is possible to observe an increase of VA.
- Acetic acid is produced naturally during alcoholic fermentation by yeast in small amounts (up to 0.3 or 0.4 g/L). The amount produced during alcoholic fermentation depends on the yeast strain, chemical composition of juice (including pH and sugar concentration), and fermentation conditions such as temperature and nutrient availability among other parameters.
- In the case of stuck and sluggish fermentations, it is possible to observe an increase of VA as a result of bacterial development.
- Fermenting over-clarified juices (less than 50 NTU) may lead to slow fermentations and increased VA productions.
- During malolactic fermentation, different lactic acid bacteria strains may lead to an increase of VA.
- Bacterial spoilage such as acetic acid spoilage or lactobacillus infection causes excessive increase of VA.
- An increase of VA (around 0.1 – 0.15 g/L) can be seen during barrel aging, especially in new barrels.

## VOLATILE ACIDITY LIMITS

The volatile acidity limit set by The Food and Drug Regulations Division 2 Alcoholic Beverages for wine is 0.24 per cent weight by volume of volatile acidity calculated as acetic acid, which corresponds to 2.4 g/L. For cider, the limit is 0.2 per cent weight by volume of volatile acidity calculated as acetic acid, which corresponds to 2.0 g/L.

According to the type of product and considering the production methods and the effect of VA on the quality, the following VA limits have been established by the NSLC. The allowances for emerging styles (such as sour cider or sour beer) are subject to change by the NSLC.

| Product | NSLC Volatile Acidity Limits (Acetic Acid g/L)[1] | | | |
|---|---|---|---|---|
| | Adherence | Minor Variance | Major Variance | Health Canada Limits (% w/v - g/L) |
| Table wine | 1.3 | N/A | Greater than 2.4 | 2.4 |
| Late harvest wine | 1.5 | N/A | Greater than 2.4 | 2.4 |
| Select late harvest wine | 1.8 | N/A | Greater than 2.4 | 2.4 |
| Ice wine | 2.1 | N/A | Greater than 2.4 | 2.4 |
| Cider | Less than 1.3 | 1.4 - 1.9 | Greater than 2 | 2.0 |

[1]Volatile Acidity as Sulphuric Acid (g/L) = Volatile Acidity x 0.815

## CONTROLLING VOLATILE ACIDITY LEVELS

It is important to have a strategy in place to avoid an excessive increase of VA during production. Some of the considerations are as follows:

- Establish cleaning and sanitation protocols in the production area, including all processing equipment and vessels.
- Before alcoholic fermentation, use an adequate amount of sulphur dioxide or other alternatives to minimize microbial populations, taking into account the health status of the raw fruits or juice.
- During both alcoholic and malolactic fermentation:
  - » Keep track and control the fermentation kinetics to avoid sluggish or stuck fermentations to limit the growth of undesired bacteria and/or yeast.
  - » Plan a strategy for the nutritional requirements of yeast and bacteria and make necessary supplements to ensure complete fermentation.
  - » If commercial yeast or bacteria are used, select proper strains that can show good performance on the specific product that is being made and that produce a low amount of acetic acid.
- During aging, minimize the oxygen contact by limiting empty headspaces, or by using neutral gases for blanketing.
- Secure microbial stability of the products before bottling, by choosing an adequate technique depending on your product and equipment availability.

## SOLUTIONS FOR PRODUCTS WITH VOLATILE ACIDITY ABOVE LIMITS

There are different techniques for decreasing the VA which can be applied depending on the amount of VA in the product and the availability of the equipment. These techniques include blending, reverse osmosis or different bio-reduction techniques using yeast for re-fermentation. In the case of bacterial contamination, sterile membrane filtration is recommended before proceeding with blending contaminated products with others.

## FOR MORE INFORMATION

If you have questions about the information found in this fact sheet, please contact one of Perennia's specialist at:

**Quality and Food Safety**
Phone: 902-896-0277
Email: foodsafety@perennia.ca

or

**Food and Beverage Innovation Centre**
Phone: 902-896-8782
Email: innovation@perennia.ca

If you have questions regarding the established limits or product testing, please contact the NSLC at **product.testing@mynslc.com**

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