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Sugars in grapes and wines demystified

Dr. Carien Coetzee
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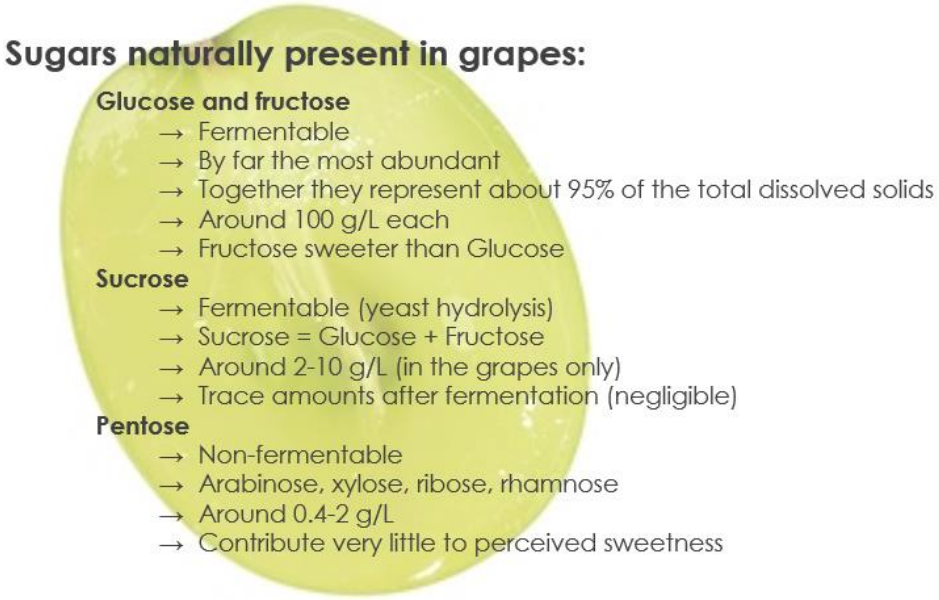
Like many concepts in winemaking, the topic of sugar is not so simple. The sugars present in grapes and wine differ in their fermentability, sweetness level and the way they can be measured. This document aims to demystify sugars and to give a breakdown of the terms and measurements used in winemaking.



Reducing sugars

→ **Glucose, Fructose, Pentose**

Reducing sugars are sugars in juice and wine that can reduce other compounds. Thus, these sugars have a specific chemical property. The reducing ability of these compounds make them measurable using the Reducing sugar method. Unfortunately, this method will not only measure the reducing sugars, but it will also measure other reducing compounds (such as phenolics, hence the decolouration step for red wines) which may contribute to reported results. The method does not distinguish between fermentable and non-fermentable reducing sugars. The main reducing sugars in grapes and wines are Glucose and Fructose. Pentose is also a reducing sugar, however, important to note Sucrose is NOT a reducing sugar.

Distilly Road, Stellenbosch
7600, South Africa
T: +27 21 882 8866/7
M: +27 82 095 9123
info@vinlab.com
www.vinlab.com
@VinlabSA

Residual sugars

Residual sugar refers to the sugar remaining in the wine after the completion of fermentation. Often the Reducing sugar method is used to measure the residual sugars. If no chaptalization took place (the addition of Sucrose), which is prohibited in South Africa for still wines, the residual sugar should be more or less equal to the reducing sugar (there is rarely more than trace amounts of natural sucrose in the finished wine). If any other non-reducing sugars are present (especially during MCC production where Sucrose can be added), the sample should undergo inversion (see below) before analysis using the Reducing sugar method.

Invert sugars / Total sugar

Inversion of a sample is the process where Sucrose is broken apart into Glucose and Fructose so it can be measured using the Reducing sugar method. In this way, you will measure the Glucose and Fructose naturally present together with the Glucose and Fructose derived from the Sucrose molecules. Essentially, the measurement using inversion will give you the total sugars result.

Sugar Free Extract

The sugar free extract is sometimes used as an indication whether a wine has been adulterated by the addition of water. Sugar Free Extract is calculated by subtracting the residual sugar from the extract and adding 1. The addition of 1 g/L to the subtracted value is done to compensate for the presence of pentose in the wine. If the wine contains more than 1 g/L of pentose, the sugar-free extract could give a false low result. By subtracting glucose and fructose from the reducing sugar (assuming no sucrose present) can give a rough estimation of the pentose content in a wine (keep in mind the presence of other non-sugar reducing compounds).

Measuring Glucose and Fructose

This is the most relevant measurement for final sugar in wine (assuming no sucrose addition). Reducing sugar analysis will include pentose which is not fermentable (no risk of refermentation) and contributes relatively little to the final perceived sweetness. The pentose may, however, be utilised by lactic acid bacteria, notably some *Peddiococcus* strains, and so must be considered. The Reducing sugar test will provide the producer with the ultimate maximum concentration of sugars (whether it be fermentable or non-fermentable). Thus, if the Reducing sugar measurement shows the wine to be fermented dry, the wine will be dry. The sum of Glucose and Fructose cannot be higher than the reducing sugar content.

Understanding the role of different sugars and how it is analysed will help the producer interpret results. International efforts are underway to encourage all countries to standardise regulatory frameworks on glucose and fructose sugar analysis methods.

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