Sugar free extract – an old measure being used in new markets

A number of wines submitted for export into China have recently been rejected because they did not meet the required levels of sugar free extract (SFE) (Wu 2015). SFE has little practical use in modern winemaking and as such it is not usually top of mind. Its use in the regulation of wine imports therefore raises several questions: What exactly is SFE? What is the relevance of this measure? And what can producers do to minimise the risk of having wines rejected?

What is sugar free extract?

Sugar free extract and the closely related measure 'total dry extract' (TDE) are historical measures for wine. The definition for TDE is as follows: "The total dry extract or the total dry matter includes all matter that is non-volatile under specified physical conditions" (OIV 2015). In other words, if you were to allow a sample of wine to evaporate to dryness under controlled conditions, the mass of material left (usually a slightly sticky solid) is the TDE. This leftover substance is made up mostly of organic acids, glycerol and sugars (Boulton 1996), but can include significant contributions from other components such as tannins and proteins, depending on the wine type. The SFE is the TDE with the mass of the sugars subtracted.

Sugar Free Extract = Total Dry Extract – total sugars

Because the majority of the SFE is derived from non-volatile materials originating from grape juice, this measure was considered in the early 1900s to be a reasonable methodology to identify wine or juice that had been adulterated by the addition of water. Unfortunately, threshold levels thought to indicate possible adulteration developed at that time appear to have been based on very limited data. It is now well accepted that variety, seasonal variations and winemaking style can lead to significant variations in the levels of TDE and SFE found in modern wines. In addition, many modern and entirely legal winemaking techniques such as the use of different yeast strains, heat treatment of juices, hydrolytic enzymes and the removal of tartrates during cold stabilisation can have impacts as large as those that would be expected from typical levels of adulteration.

How is SFE tested and what are the regulations?

In modern laboratories, SFE is now generally measured not by evaporating wine but by using a formula based on measurements of the wine's specific gravity, alcohol, SO_2, VA and sugar. A complication can arise, however, when different methods are used to measure the sugar component. In much of the world the sugar content of a non-sparkling wine is defined as the combined quantity of glucose and fructose. These are the grape sugars that actively

contribute to the perceived sweetness of wine (glycerol and alcohol also contribute) and are the sugars at risk of unwanted continuing fermentation. Other non-fermentable sugars tend to be present in relatively insignificant amounts and contribute little if anything to perceived sweetness. Glucose and fructose are generally measured very accurately by either HPLC or enzymatic techniques. In China, however, standard sugar analysis methods are primarily based on reducing sugar techniques (e.g. Rebelein or Layne–Eynon methods). While these are well-established methods in wine analysis, they detect not only the majority of sugars found in wine but also a range of other wine compounds. This means these methods will always give a higher result than glucose + fructose analysis. In the latest rounds of testing conducted by the Interwinery Analysis Group, the average difference between glucose + fructose and reducing sugar methods was 1.3 g/L for white wines and 2.2 g/L for red wines. Reducing sugar methods are also significantly less precise than glucose + fructose methods, with average standard deviations regularly more than twice as large.

The use of reducing sugar methods can lead to significantly lower and more variable SFE results than might be calculated by a laboratory using enzymatic or HPLC techniques. This, in conjunction with the natural variations in this measure, can result in a wine that has been produced by perfectly legal means failing to meet the regulations currently imposed by China. The minimum levels for SFE, as defined in Chinese regulation, are 16 g/L for white wines, 17 g/L for rosé wines and 18 g/L for red wines. These values appear to be sourced from very old European standards. Most countries no longer apply these rules as it is recognised that the actual ranges for legally made wine can extend from 7 g/L (some low alcohol German wines) through to 30 g/L (late harvested red wines) (Amerine and Ough 1980), making the use of such an arbitrary standard problematic.

What can producers do?

When exporting to markets that impose regulatory controls that differ from those in Australia it is recommended that wines be tested before shipment to ensure compliance with the destination market's requirements. For wines intended for export to China it is important to ensure that the laboratory conducting the analysis uses a reducing sugar method to calculate the SFE. The result can then be compared to the Chinese regulations before the wine is despatched. If the value for the wine falls below the required value, there are limited options available to remedy the issue and producers are encourage to contact Wine Australia or the AWRI helpdesk for advice. The Australian government is continuing to lobby through various forums to change arbitrary limits such as this one in order to facilitate the continued market access of Australian wines.

References

Amerine, M.A. and Ough C.S. (1980) Methods for the analysis of musts and wine. New York: Wiley-Interscience: 29–30.

Boulton, R.B. (1996) Principles and practice of winemaking. New York: Chapman & Hall: 138–139.

OIV (2015) Compendium of international methods of wine and must analysis – Volume 1. Paris: OIV.

Wu, S. (2015) Chinese customs rejected hundreds of 'substandard' imported wines in 2014. Decanter China. http://www.decanterchina.com/en/index.html?article=1010.

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