

Measuring Alcohol And Residual Solids

by Werner Roesener

This is an easy method, yielding instantaneous results of the alcoholic strength as well as residual solids (sugar) in finished wine.

Equipment required:

1. A narrow range hydrometer (SG 980 – 1022), Note 1
2. A refractometer, calibrated for 0 – 32 Brix

The method is based on the scientific facts that the gravity of wine is affected by alcohol in one direction (lighter), and by sugar solids in the opposite direction (heavier). The refractometer, however measures the optical bending of light traversing through a wine sample, and both sugar and alcohol produce readings in the same direction (increased brix reading for both).

The procedure is to take a hydrometer reading, record the SG, then to place a small drop of wine on the refractometer prism and record the resulting brix reading. Those two numbers are then placed into the following formulae to obtain alcohol and solids content.

$$\text{Alcohol (vol \%)} = (B * 4.16 - SG + 1000) * 0.365$$

$$\text{Solids (g/L)} = (SG - 1000 + ALC * 1.264) * 2.52$$

Where SG is in 3 or 4 digits, ALC is in vol %, B is the brix reading. To expedite the calculation, the formulae can be entered into a programmable calculator (Note 2), or into a PC program in BASIC, C or PASCAL. It should be kept in mind that solids are made up of mostly sugar, but also the acids and other minor solid components in wine. When dealing with sweet wines, pretty near all of the solids can be assumed to be sugar. The measurement accuracy is affected by temperature. It is essential that all involved items are stabilized at the same temperature, preferably in the 15 – 18 degree Celsius range. I have been asked if the method would be suitable for following the fermentation progress. In principle, yes, but the cloudiness of fermenting wine blurs the refractometer reading, making it difficult to obtain meaningful numbers.

When glycerol is added to wine, the method is fooled to recognize glycerol as alcohol. Therefore, it is advisable to make measurements prior to adding glycerol. The small amount of glycerol produced normally during fermentation is already compensated in the formula.

Here is a numerical example:

A port wine produces these readings: SG 1022, Brix 18.3

Calculation results: 19.8 % alcohol, 118 g/L solids

Note 1: A wide range hydrometer can be used, but the accuracy suffers when measuring dry to medium sweet wines. Dessert, sweet aperitif and after dinner wines, on the other hand, frequently read beyond the narrow range hydrometer and give satisfactory results with the wide range instrument. I keep both types on hand for these reasons.

Note 2: My recommendation for a programmable calculator is Texas Instrument TI-83PLUS. There are other makes around, but I found that the TI product beats them when it comes to ease of programming.