

Measurement and Control of Acid

by Paul Dunseath

The two common methods of acid measurement are by pH, which measures the strength of the acid, and titratable acidity, which measures the total amount of acid, without regard to its strength. The definition of pH is “the reciprocal of the logarithm of the Hydrogen ion concentration”; it is the hydrogen ion which results in acidity in a liquid, and this bit of mathematical legerdemain avoids having to deal with long strings of zeroes, although it has the unfortunate, and non-intuitive, result that the lower the pH, the higher the acidity. Consequently, possible values for pH run from 1 to 14, with 1 being that of a highly caustic acid while 14 is that of an equally highly caustic alkali. Pure water has a neutral value: 7.

The pH values of wines range generally from about 3.6 to 2.8, and can be measured approximately with litmus paper, or fairly accurately with pH meters. These latter can be bought from about \$50 up to several hundred, and require calibrating before use with “test liquids” of known pH. For the simplest types, a portable, shirt-pocket size, one simply dips the end in the liquid, presses a switch, and reads the pH from a LCD display.

Human taste responds not only to the strength of the acid, but also to its total amount. In addition, wine contains buffers – substances which tend to inhibit a solution from changing its pH when the total acidity changes. Consequently the pH value of a wine, while important as an indicator of the ripeness of the grapes, and the ability of the juice to withstand bacterial attack, does not track fully with the change in taste as total acidity changes; the quantity of acid present – to which our tastes are sensitive – can vary quite widely without any significant change in the pH, if the wine is heavily buffered by such compounds as tannins and proteins. Different grape varieties have different buffering ability, while other fruit used in “country” wines may have a considerable buffering capacity; elderberries and bananas are prime examples.

For most home winemakers titratable acidity, which directly measures the acidity in a wine and is unaffected by buffers, is the simplest measure to use. It is based on two facts:

- one is that alkalis (commonly called bases) and acids neutralize each other,
- and the other is that there are substances that change colour depending on whether they are in an acidic or basic environment.

Titratable acidity is measured by adding to a measured sample of the wine a few drops of an indicator (typically, phenolphthalein, which is colourless in acids but bright pink in bases).

A base of a known strength is added, drop by drop, and when a colour change occurs and remains, it is evidence that the acid has been completely neutralized.

Knowing how much base was required indicates very quickly the acidity of the sample.

The sample is then discarded.

Since each acid has a different level of activity, it is necessary to define the amount present as “equivalent” to that of one acid.

As tartaric acid is the most common one in wines, we define the acid level in terms of “tartaric acid equivalent”. This gives us such typical values as 5.5 ppt (parts per thousand) “as tartaric”.