PHENOLIC RIPENESS IN SOUTH AFRICA

The study of phenolic ripeness in wine is essentially a quantitative analysis of the anthocyanins and tannins in grapes. Anthocyanins are responsible for the colour of red wine and it is also known that the intensity of colour in wine is in direct proportion to the quality of wine. Grape tannins can be separated into two categories, namely skin tannins and seed tannins. Tannins are essentially bitter, and need to polymerise (chemically bind) together with anthocyanins to form stable, acceptable tasting flavourants. The analysis of these phenolic compounds is carried out by using a modified Glories method.

The phenolic (physiological) ripeness assessment varies from the conventional analysis of sugar, acid, and pH because the two analyses may not indicate ripeness at the same time. Sugar is a component that is often used to assess ripeness and in general is the norm of assessing the quality as well, the concentration is dependent on weather and hang time. Sugar content increases during ripening and is therefore a function of berry age. Sugar is also relatively easy to assess, adding to its value as an index of ripeness. Phenolic ripeness on the other hand is independent of weather and only dependant on hang time. The concept of physiological ripening includes skin colour, berry texture, seed colour and ripening, flavour, and phenolic changes. In warm to hot climates sugar increase compared to flavour increase and acid decrease occurs at a faster rate. The resulting wines tend to be high in alcohol without necessarily being accompanied by ripe fruit aromas. On the other hand, varietal flavour appears to increase more quickly relative to sugar in cooler climates.

The results that are obtained for phenolic ripeness are the following:

- Maximal anthocyanins that the grape can deliver (under the method of evaluation employed) = $[A]_{pH1.}$
- The amount of anthocyanins which can be extracted under wine making conditions = $[A]_{pH3.2}$.
- The percentage extraction [Ea] of the anthocyanins obtained under wine making conditions, which is $Ea = ([A]_{pH3.2}/[A]_{pH1})*100$.
- The amount of seed tannins.
- The amount of skin tannins.
- The contribution of seed tannins to total tannins as a percentage [Mp].
- The total amount of phenolic compounds present [PFT].
- In addition the sugar, acid, and pH are also determined.

Phenolic ripeness is expressed in terms of:

1. The percentage extraction of anthocyanins, which ideally should be ≥60%;
2. $[A]_{pH1}$ should have peaked, otherwise the maximum flavour has not been achieved and
3. The contribution of seed tannins to total tannins should be ≤15%.

Once the potential level of anthocyanins has peaked, the extraction levels of the anthocyanins as well as the concentrations of seed tannins come into play to determine grape ripeness - and these factors can then assist in determining the harvest date. If, however, the anthocyanins level has not peaked, then full phenolic ripeness will have not been achieved.

From the above values the following factors can be determined:

- Quality of grapes – determined by the peak of $[A]_{pH1}$, different levels are given for each grape variety.
- Stress, heat or water to the grapes – this is seen by a sharp drop in $[A]_{pH1}$ in consecutive measurements.
- The effect of tipping and topping – determined by the magnitude in $[A]_{pH1}$ achieved
- The effect of bunch thinning – determined by the magnitude in $[A]_{pH1}$ achieved
- The effect of canopy management – determined by the magnitude in $[A]_{pH1}$ achieved
- Indication of ripeness – as given by the three factors described above.

Although there is an increasing awareness of “phenolic ripeness”, the term remains a buzzword; it is liberally quoted, but seldomly fully understood by winemakers and viticulturists. It is especially the chemistry aspect of this term that is much neglected, while the sensational tactility such as mouth feel and taste are readily quoted.

The Glories method of analysis of phenolic ripeness has yielded good results in South Africa and is the most common method currently used to analyse the amount of phenolic compounds within the grape. The most important use of this method is to judge the quality of the fruit from the potential anthocyanin concentration that the grape can deliver. The values achieved in a season are also an indication of the vintage. It has categorically been shown that the amount of anthocyanins present in the grape is responsible for the quality of the wine, hence the following parameters have been established to categorise the various varieties of grapes.

Variety	Quality category of grapes based on [A_{pH1}]	
	Good	Excellent
Cabernet Sauvignon	>1600	>2000
Cabernet Franc	>1150	>1400
Merlot	>1400	>1650
Pinotage	>1000	>1400
Shiraz	>1550	>1800

Grape quality categories based on potential anthocyanins level [A_{pH1}] (results as determined by the Glories method)

The Glories method is able to quantitatively detect any changes in viticultural practices that influence the amount of anthocyanins in a grape and the timing of optimum anthocyanin concentration. Water appears to be the most influential factor on the level of anthocyanins in the grape, including the amount as well as the timing of administration. It has also been shown that bunch thinning and topping have a dramatic effect on phenolic ripeness and that virused vines show different phenolic ripeness to un-virused vines. Hence the Glories method of determining phenolic ripeness could be an excellent methodology to evaluate the effect of any viticultural practices on the grapes.

The Glories method takes considerable time before results can be obtained. It has been shown that results can be obtained in a five and a half to a six hour period, thus allowing results to be obtained within the same day of sampling.