Automated Tartaric Acid Analysis in Wine Using a Discrete Analyzer

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INTRODUCTION

Acids in the right combination provide wine their crisp, slightly tart taste. If a wine is too low in acid, it tastes flat and dull; too high in acid and it is tart and sour. The tartaric acid, not found in most other fruits, is the primary acid in the grape and thus controls the acidity of a wine. It plays a critical role in the taste, feel, and color of wine. And more importantly, it lowers the pH to a level that improves resistance to bacterial contamination, acting as a preservative. A tartaric acid deficiency, can therefore contribute to various wine issues.

The purpose of this study was to evaluate the determination of tartaric acid in red wines using Thermo Scientific™ Gallery™ automated discrete analyzer.
The evaluated red wine method correlated well (y = 0.9627x + 0.235, R^2 = 0.9304) with the flow injection analysis (FIA) method.

METHOD

The tartaric acid method, used on the Gallery analyzer is based on formation of a complex between tartrate and vanadate. The color of the formed complex is measured at the wavelength 540 nm. There is no need for pretreatment of red wine samples since the red color is removed by hypochlorite during the automated procedure.

MATERIALS

Instrument

The analysis was performed using Thermo Scientific Gallery discrete photometric analyzer. The analyzer is shown in Figure 1.

Figure 1. Gallery discrete photometric analyzer

Reagents

Thermo Scientific Tartaric acid system reagent kit, product code 984309, was used for the measurement. Calibration standard (4 g/L) is included in the kit.

Calibration

Calibration was performed using a standard included in the reagent kit. The concentration of the standard is 4 g/L. The calibration points were automatically diluted by the analyzer.

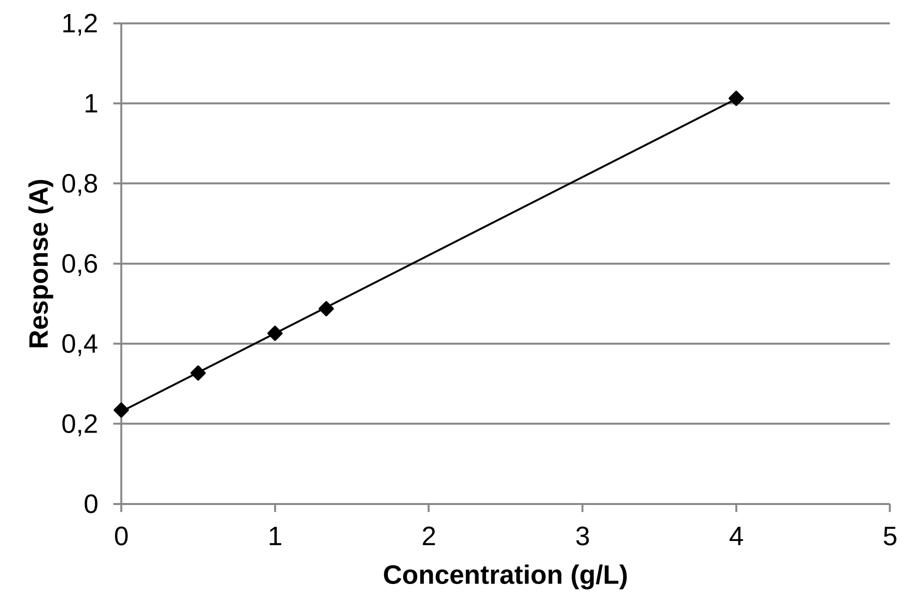

Figure 2. Example of the calibration graph

RESULTS

Linearity

Method linearity was tested with pure chemicals dissolved in de-ionized water. The linearity was optimized to cover a typical sample range. Samples with tartaric acid concentrations above the calibration range >4 g/L are diluted to 1:3 with the automatic dilution feature.

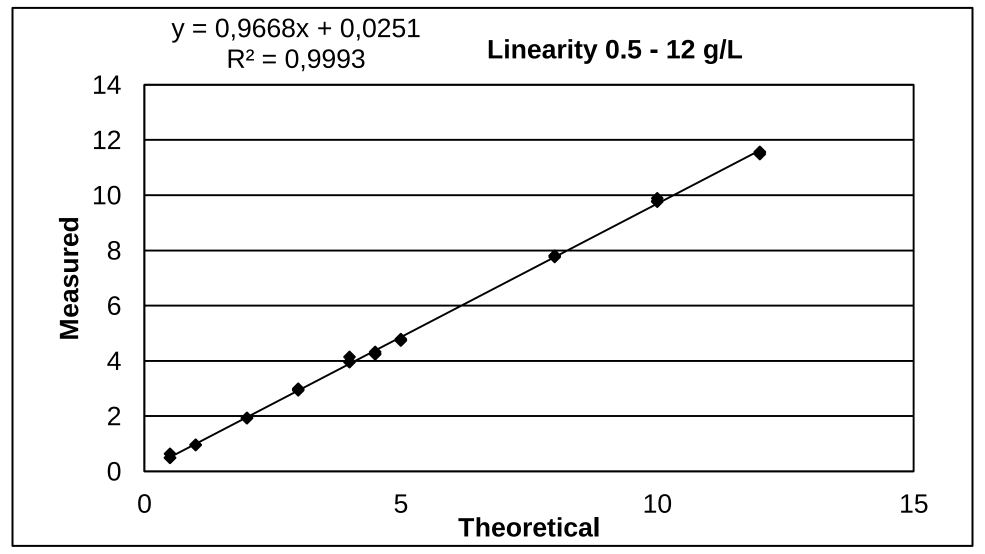

Figure 3. Linearity of the method

Repeatability

A repeatability study was performed by analyzing both white and red wine samples with the Gallery analyzer in three batches, 10 replicates in each batch with a total number of *n*=30 for each sample. The test was calibrated at the beginning of each batch and the method repeatability data is shown in Table 1.

	White wine		Red wine	
	N	30	**N**	30
	Mean	2.76	**Mean**	2.11
	SD	**CV %**	**SD**	**CV %**
Within run	0.045	1.6 %	0.052	2.5 %
Between run	0.043	1.5 %	0.042	2.0 %
Total	0.062	2.2 %	0.067	3.2 %

Table 1. Repeatability of white and red wine samples

Method comparison

For the method comparison study, 33 red wine samples were analyzed. Results were compared against the FIA method. Recovery rates varied between 83-107 %, which shows good correlation between the two methods.

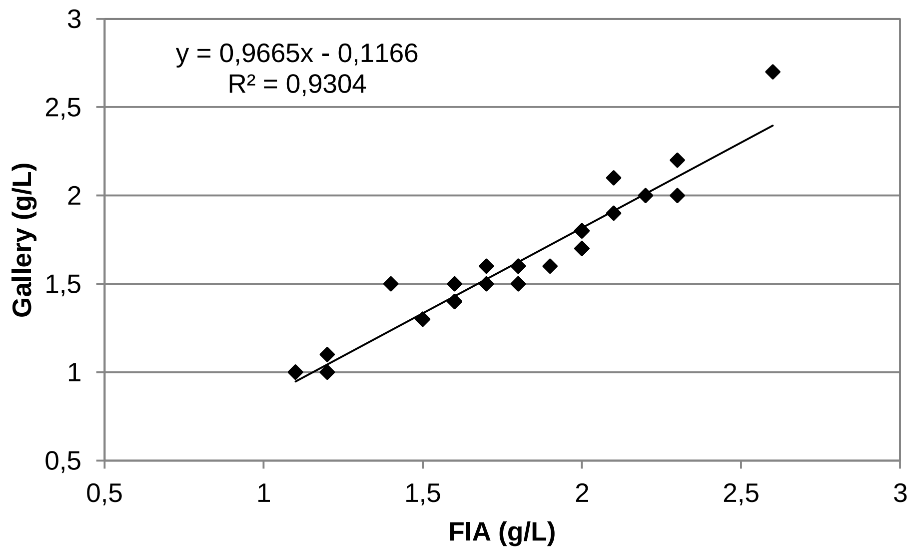

Figure 4. Method comparison results

CONCLUSIONS

This study shows that the Gallery tartaric acid method is a precise and accurate method suitable for monitoring tartaric acid concentrations in wine. Analyzing red wine sample is typically challenging due to the strong sample color. However, the Gallery method automatically removes sample color interference, saving hands-on time as no pretreatment is needed.

In addition, the automated Gallery discrete analyzer is capable of simultaneously analyze from a single sample other important wine and must parameters, for example sugars, other acids and yeast available nitrogen.

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