Title Examination of non-destructive measurements of red wine grapes using visible/NIR spectroscopy

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Abstract

Precision viticulture demands that grape growers are able to quickly determine quality parameters such as brix, titratable acidity, pH, phenolics and anthocyanins for their crop. With this goal in mind researches turned to near-infrared spectroscopy and multivariate statistical modelling as a means of non-destructive grape testing. More recently, in an attempt to reduce the cost of equipment, visible spectroscopic implementations are being pursued. To this end, the ability of a generic visible spectrometer was compared to the only commercially available near-infrared implementation.

A simple sampling platform was designed to utilize a generic spectrometer, the design was meant to be simple to implement and to be cost effective while attempting to make improvements over the current system. The designed platform collected spectral data, 350 to 850 nm at 1 nm increments, for multiple grapes simultaneously. This was in contrast to the current implementation that samples a single grape at a time for wavelengths from 1100 to 2300 nm at 2 nm increments.

Data was collected for three red wine grape species, from four separate blocks, over a period of ten weeks from veraison to harvest. Each of the 200 berry samples collected was scanned using both measurement systems and analyzed chemically to determine their quality parameters. Partial least square models, for each system, were constructed. A comparison of these PLS models was based on the amount of variance that each model was capable of explaining.

The experimental platform demonstrated potential to perform non-destructive grape quality measurements in a fraction of the time required by the commercial implementation. While the limited dataset collected made it impossible to determine the full capabilities of the experimental platform, several recommendations were suggested to guide future research.