Non-invasive quantification of phenolic content in red and white wines using a portable fluorescence spectrometer

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Phenolic compounds contribute to some of the most important red and white wine quality attributes. These compounds are mainly involved in the colour and mouthfeel properties of wines. In red wines, phenolic compounds are extracted during maceration as the goal is to optimise the phenolic extraction and ensure optimal colour and mouthfeel properties. In white wines, the objective is to minimize and control phenolic extraction during early stages of winemaking to ensure that the mouthfeel properties are not compromised. In a previous study, we first assessed the suitability of fluorescence spectroscopy to quantify phenolic content from undiluted and untreated samples (dos Santos et al., 2022). Accurate regression calibrations were obtained making use of XGBoost regression. After the identification of the fluorescence parameters that allowed for the accurate quantification of phenolic compounds, a simplified portable fluorescence spectrometer was built making use of single excitation (280 nm) and multiple emission. The fluorescence properties of red wine fermenting samples were measured together with the phenolic content. PLS calibrations were then attempted, and accurate models were obtained. For white wines, the spectral properties of samples at different times during the pressing operation were obtained. In this case, the total phenol content of the samples was measured. The results showed that it was also possible to quantify the total phenol content in white wine juice samples. In addition, a measuring chamber was constructed allowing for front-face and direct reflection measurements. The chamber can be incorporated in a fermenting tank or in a pipe at the outlet of the press. The nature of fluorescence technology and the set up of the instrument also allows for direct reflexion ultraviolet measurements. The simplicity of this portable spectrometer and the fact that relies on ultraviolet visible technology provides a valid and cost-effective alternative to other available technologies.

**Keywords:** fluorescence spectroscopy, unaltered samples, direct measurements, phenolic compounds, chemometrics

**Acknowledgements:** The authors gratefully acknowledge Winetech South Africa for funding and support under the grant number (JT-NP07).

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