

## Hyperspectral imaging for the appraisal of varietal aroma composition along maturation in intact *Vitis vinifera* L. Tempranillo Blanco berries

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### Abstract:

**Context and purpose of the study** - The knowledge of the grape aromatic composition during ripening provides very important information for winegrowers, who may carry out different viticultural practices, or determine the harvest date more accurately. However, there are currently no tools that allow this measurement to be carried out in a non-invasive and rapid way. For this reason, the aim of this work was to design a non-invasive methodology, based on hyperspectral imaging to estimate the aromatic composition and total soluble solids (TSS) of Tempranillo Blanco berries during ripening.

**Material and methods** – A total of 236 spectra of intact grape berries were acquired, under laboratory conditions, by hyperspectral imaging (HSI) in the visible + short wave near infrared (VIS+SW-NIR) range (400-1000 nm) to estimate the aromatic composition, and the TSS, of *Vitis vinifera* L. Tempranillo Blanco berries during ripening. Calibration, cross-validation and prediction models were built by partial least squares (PLS), using as reference the concentration of 20 grape berries' volatile compounds (terpenoids, C<sub>13</sub> norisoprenoids, benzenoids, fatty acids, and C6 compounds), measured by gas chromatography - mass spectrometry (GC-MS), and the concentration of total soluble solids (TSS), measured by refractometry.

**Results** - Values of determination coefficients of cross-validation ( $R_{cv}^2$ )  $\geq 0.70$ , were obtained for all terpenoids ( $\alpha$ -terpineol citral, linalool, and *p*-cymene), all C<sub>13</sub> norisoprenoids ( $\beta$ -damascenone and  $\beta$ -ionone) and their total, all benzenoids (benzaldehyde, 2-phenylethanol, and benzyl alcohol) and their total, two fatty acids (octanoic acid, and nonanoic acid), four C6 compounds (2-hexenal, hexanal, 2-hexen-1-ol, and (Z)-3-hexen-1-ol) and their total, the sum of all families except C6 compounds (called as total positive compounds), and TSS. Therefore, it can be affirmed that hyperspectral imaging in the VIS+SW-NIR range could be a suitable tool to estimate the aromatic and industrial maturities of Tempranillo Blanco grape berries in a simultaneous, contactless and non-destructive way.

**Keywords:** volatile compounds, partial least squares, total soluble solids, non-invasive, VIS+SW-NIR, TF-SPME