Terroir effects on the reflectance spectra of the canopy of four grape varieties

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Knowledge of the reflectance spectrum of grape leaves is important to the identification of grape varieties in images of vineyards where several cultivars co-exist. As a non-destructive technique, spectroradiometry delivers reflectance spectra with high signal-to-noise ratios. This work reports results from field measurements of reflectance of four grape varieties in the spectral range 450nm to 2500nm, performed in south Brazil. Three viticultural regions were visited and in vivo measurements of Merlot, Pinot Noir, Chardonnay and Italian Riesling were performed. All spectra were normalized to have unit area and were compared. Due to the small noise level, spectral features from each variety were revealed, with intensities of the order of 10^{-4} to 10^{-5} with respect to the normalized reflectance range from 0 to 1.These features were present in several, repeated measurements, and so were considered as real. In a preliminary analysis they were attributed to be due to the presence or absence of pigments as anthocyanins in the measured grape leaves, since the experiments used red and white grapes. It is known that such pigments are present not only in berry skins, but also in vacuoles within cells in leaves. This has an impact in leaf texture and so in infrared reflectance [1]. Spectral differences were present in many wavelengths, including around 552, 577, 662, 884, 1059, 1263, 1981, and 2051 nanometers. A statistical discriminant analysis was made to search for terroir effects which introduce differences between regions. Detailed knowledge of the spectral signatures of grape varieties can be relevant to the development of identification algorithms used to classify remote sensing images of viticultural regions where several cultivars are present, and to in-field inspections using radiometers.

[1] Da Silva, P.R.; Ducati, J.R. International Journal of Remote Sensing, 30 (2009), pp. 6085-6098.