Selection of the optimal region of interest for the quality prediction in oranges analysed using hyperspectral imaging technology

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The use of Hyperspectral Imaging (HSI) for the determination of quality in oranges has been previously assessed in different research works. However, since this technology provides both spectral and spatial information, it is essential the reduction of data for the implementation of this technology at industrial level. Nevertheless, an excessive reduction can cause a loss of important data, being crucial to select the most representative information of the sample, which is especially challenging in the case of products of great heterogeneity. It is in this context that the importance of this work, carried out in the framework of a SensorFINT Short-Term Scientific Mission (STSM) at the University of Modena and Reggio Emilia, lies. The aim of this work was the optimization of the selection of the region of interest (ROI) in oranges hyperspectral data to determine internal quality parameters related to the consumer acceptance, such as soluble solid content (SSC), titratable acidity (TA), maturity index and BrimA. For this purpose, a total of 250 oranges were analysed using a hyperspectral camera working in the spectral range 946.6-1648.0 nm. Partial least squares regression (PLS) and its multilinear version (NPLS) were compared. VIP scores obtained from the NPLS model were used to select the most relevant pixels to predict the studied parameters, reducing the data redundancy. The results obtained demonstrated the viability of using HSI for predicting internal quality in oranges. Furthermore, the selection of the most representative pixels by means of the VIP scores confirms its adequacy for data selection, enabling to reduce the computational time without a reduction of the robustness, when applied to a hyperspectral data set of oranges as complex and large as the one used in this work.

**Keywords:** Hyperspectral imaging, oranges maturity, pixel selection, multilinear models

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