Optimizing spatial data reduction in hyperspectral imaging for the prediction of quality parameters in intact oranges

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Abstract

This study evaluated hyperspectral imaging (900–1700 nm) and the optimal binning strategy for the reduction of spatial data to obtain quantitative maps of some quality attributes in intact oranges. Artificial neural network (ANN) was used to develop prediction models using 198 oranges. Different levels of pixel binning were tested for predicting the samples of an external test set (N = 66). The best models obtained achieved root mean square error of cross validation (RMSECV) values of 0.87 %, 0.23 g L^{-1}, 2.78 and 1.11 for SSC, TA, MI and BrimA, respectively. Models were then applied to different spatial resolution sample images. The coefficients of determination (R^2) and the root mean square error of prediction (RMSEP) values for the test set were then compared. A chemical image was developed to display the distribution of SSC, TA, MI and BrimA in the binned images of the orange fruit, demonstrating the potential of using a 10 × 10 spatial binning (corresponding to a 99 % reduction in the original dataset) to develop prediction models for quantifying taste attributes in intact oranges.