Avocado dehydration negatively affects the performance of visible and near-infrared spectroscopy models for dry matter prediction

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Abstract

This study aims to test the hypothesis that skin dehydration can cause the development of cork-like layers in the avocado fruit skin which may negatively affect Vis-NIR spectroscopy. To test this, dehydration treatment was applied on avocado fruit by storing them at low relative humidity (RH) during ripening treatment. Furthermore, to demonstrate that the hypothesis was not only valid for a single instrument and in general valid for any type of Vis-NIR instrument the avocados were also measured with two different spectrometers i.e., lab-based, and hand-held. Since the two instruments have two different measurement geometries i.e., diffuse reflection and interaction, the study also tests which geometry was best for the measurement of DMC in dehydrated avocados. The results showed that the dehydration of avocado fruit negatively affects the performance of Vis-NIR calibrations compared to the non-dehydrated fruit. The root mean squared error of cross-validation ($RMSE_{cv}$) on internal test set for dehydrated and non-dehydrated fruit were up to 1.49 % dw/fw and 1.02 % dw/fw, respectively. The hypothesis was true for both lab-based and hand-held instruments, and the root mean squared error of prediction on internal test set were up to 28 % higher for dehydrated fruits. The performance of interaction measurement mode was better ($RMSE_{cv}$=0.98 % dw/fw) than the diffuse reflection mode ($RMSE_{cv}$=1.21 % dw/fw) for non-dehydrated fruit, however, both modes achieved similar performance ($RMSE_{cv}$ = ～1.42 % dw/fw) for dehydrated fruit. The poorer performance of Vis-NIR models on dehydrated avocado fruit can be accepted as a limitation of Vis-NIR spectroscopy for avocado fruit analysis.