

Deep Learning and Chemometrics Aided Development of a Virtual Hyperspectral Imaging and Quality Assessment of Plant Proteins

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The food industry is seeing considerable growth in demand for plant-based protein products. This study aims to develop virtual hyperspectral imaging (VHSI) by using deep learning methods to reconstruct hyperspectral images from RGB images and using the develop VHSI to assess the quality of pea proteins. Near-infrared HSI (900 – 1700 nm) was used to capture images of pea proteins. A smartphone camera was also used to capture the images of the same samples under different illumination scenes. The acquired hyperspectral images were preprocessed using different spectral preprocessing methods to augment the data. A deep learning model was used to convert the RGB images to hyperspectral images with multiple bands across the NIR spectral range. Chemometrics or machine learning methods were applied to develop predictive models for predicting pea protein quality attributes. Results of the study show that hyperspectral images were accurately reconstructed from RGB images. It also shows that the reconstructed images accurately predicted pea protein quality properties. The findings indicate that the development of an alternative approach to measuring food quality based on the developed VHSI would have wide application as a low-cost device for at-line, in-line, and on-line food quality control and traceability.