

Potential of Vis-NIR spectroscopy for detection of chilling injury in kiwifruit

Zhen Wang, Rainer Künnemeyer, Andrew McGlone and Jeremy Burdon

Postharvest Biology and Technology, Volume 164, June 2020, 111160

Abstract

This study examined the non-destructive assessment of chilling injury in *Actinidia chinensis* var. *chinensis* 'Zesy002' kiwifruit by means of visible – near infrared interactance spectroscopy. Chilling injury is a physiological disorder which may develop when kiwifruit are stored at commercial storage temperature of 0–1 °C. Symptoms may include a granular appearance, corky outer pericarp and water-soaked tissue. The initial symptoms are visible only when the fruit is cut open.

The data set used in this study consisted of 129 'Zesy002' kiwifruit, with chilling injury symptoms assessed visually when the fruit was dissected and classified on a five-point severity scale from sound to severe. Near-infrared (NIR) interactance spectral analysis (principal component analysis with standard normal variate (SNV) pre-processing on the wavelength range of 700–1000 nm) was effective in segregating the fruit by symptom severity. A stronger separation between severely damaged fruit and sound fruit was achieved when the NIR measurements were made at the stylar end of the fruit. The optical properties of absorption and scattering coefficients were measured on a selection of excised kiwifruit slices and extracted kiwifruit juice using inverse adding-doubling and light transmittance methods, respectively. A comparative examination of impact damaged fruit (data set of 22 fruit; 11 sound, 11 impacted) gave an alternative perspective on water-soaked tissue, which has a similar appearance in chilling injured and impact damaged fruit, but showed different spectral shapes. It is speculated that the presence of water-soaked tissue might be less informative after SNV processing than corky and granular tissue for the detection of chilling injury. This study reports that there is good potential to use NIR spectroscopy for detecting kiwifruit with chilling injury symptoms.