

Effect of pressing and impacting bruises on optical properties of kiwifruit flesh

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Abstract

Near-infrared spectroscopy and hyperspectral imaging technologies have been proved to be able to detect invisible bruised kiwifruit. Therefore, it is doubted that the optical properties of kiwifruit are affected by bruises. However, it is not clear how bruises influence the optical properties of kiwifruit and whether different bruises have same effect on optical properties. To answer these questions, the kiwifruit with pressing and impacting bruises were used as samples, and the non-bruised kiwifruit were used as control to investigate the absorption coefficient (μ_a) and reduced scattering coefficient (μ_s') of kiwifruit flesh by using an integrating sphere system in 950–1650 nm in 16 d after bruising. Moreover, the soluble solids content (SSC), moisture content, firmness and color were measured, and the microstructure of flesh tissue was observed. The results showed that at the absorption peaks of 980 nm and 1175 nm, the μ_a of used samples increased first, then decreased with time after bruising. At the same time, the bruised samples had higher μ_a than non-bruised ones, but there was no significant difference ($P \leq 0.05$). After bruising, the μ_s' decreased first, then increased with time at a given wavelength between 950 nm and 1360 nm. The μ_s' of bruised samples was significantly smaller ($P \leq 0.05$) than that of non-bruised samples at the same time. Bruises caused cell rupture and reduced firmness. The results indicate that scattering technique has great potential in identifying bruised kiwifruit from non-bruised ones. This study is helpful to understand the effect of bruises on optical properties of kiwifruit and to better apply near-infrared spectroscopy and hyperspectral imaging technologies to detect the kiwifruit with internal bruises.