Excess water loss induced by simulated transport vibration in postharvest kiwifruit

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Abstract

Fruit usually suffers from water loss after transportation and storage, which largely blemishes the quality characteristics including appearance, saleable weight and texture. This study was conducted to interpret the potential relations between fruit water loss and transport vibration. Kiwifruit were subjected to vibration using an electrodynamic shaker followed by storing at 25 °C and 75% RH (relative humidity) in dark for 12 d. Fruit weight loss and water content in the epidermis (EP), outer pericarp (OP), inner pericarp (IP) and core tissues were determined. Shrinkage of EP cells and water movement were evaluated using laser scanning confocal microscopy and magnetic resonance imaging, respectively. Cell damage was investigated by observing the ultrastructure and electrolyte leakage. The results showed that fruit water loss was accompanied with the spatial movement of water from interior IP, OP and external EP. Vibration damaged the fruit cells with plasmolysis, membrane contracting and increased electrolyte leakage, which accelerated movement of water from the tissues to outward resulting in severe water loss of fruit. However, the electrolyte leakage and water content in the core were little changed in both control and vibrated fruit. Shrinkage of EP cells coupled with fruit shrivel appeared by 4 d of storage after vibration. However, the symptom in control fruit was not observed until 8 d of storage. It could be concluded that the simulated transport vibration caused intracellular damage in fruit tissues, which accelerated the water loss and shriveling process.