

Postharvest hot water dipping and hot water forced convection treatments alleviate chilling injury for zucchini fruit during cold storage

Min Zhang, Wei Liu, Chunhui Li, Tingting Shao, Xue Jiang, Huizhong Zhao and Wenting Ai

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Abstract

The effects of hot water dipping (HWD) and hot water forced convection (HWFC) treatments on the quality and membrane integrity of zucchini fruit were investigated during cold storage at 4 °C. Zucchini fruit were treated with hot water dipping at 40 °C for 25 min or hot water forced convection at 40 °C at a water flow rate of 2 m/s for 20 min, each of which produced the same heat absorption inside the fruit. Then, all fruit were placed into refrigerated storage at 4 ± 0.5 °C with 85–90 % humidity for 15 d. The results indicated that treatment with HWD or HWFC alleviated chilling injury (CI) in zucchini fruit compared with an untreated group (CK). Nevertheless, the HWFC treatment was more effective in reducing CI, maintaining quality and alleviating membrane injury than was HWD, which decreased the decline in fruit firmness, Total soluble solids (TSS) content and ascorbic acid (AsA) content and reduced relative electrolyte leakage (EL), malondialdehyde (MDA) content and weight loss in zucchini fruit during cold storage. In addition, analysis of heat transfer progress characteristics indicated that the effect of heat treatment on the quality and membrane integrity of zucchini fruit during cold storage was related not only to heat temperature and time but also to heat transfer modes, including forced convection and natural convection. Yielding the same heat absorption inside the zucchini fruit during hot water treatment, the HWFC treatment with a forced convection heat transfer mode could shorten the heating time and provided more advantages in zucchini fruit preservation during cold storage than did the HWD treatment under a natural convection heat transfer mode.