Title Importance of storage temperatures in maintaining flavor and quality of mandarins

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Abstract

Mandarins suffer from short 'flavor-life' compared with other citrus species. The recommended minimum safe temperature for mandarin storage is 5–8 °C. However, because of continuing reductions in permitted chemical residues and increasing concern regarding decay development, mandarins are often shipped at much lower temperatures of 3–4 °C. In the last few years we noticed wide differences in responsiveness of mandarin varieties to chilling, and that the earliest indication of damage was a decrease in flavor acceptability. In the present study, we evaluated changes in flavor and quality of chilling-tolerant 'Or' and chilling-sensitive 'Odem' mandarins after 4 weeks of storage at 2, 5, or 8 °C followed by 3 days at 20 °C. Low storage temperatures resulted in loss of orange peel color in fruit of both varieties, which became paler and yellowish. The flavor of 'Or' mandarins was not affected by different storage temperatures, whereas 'Odem' showed severe flavor loss at low storage temperatures. GC–MS analysis of aroma volatiles revealed that changes of storage temperatures had no major effects on aroma volatile contents in 'Or' mandarins. However, in 'Odem' mandarins, storage at 2 °C caused accumulation of 13 volatiles, mainly terpenes and their derivates, whereas storage at 8 °C resulted in decreases of six volatiles, comprising five terpenes and one terpene derivative. Overall, we conclude that storage temperature is a fundamental factor affecting color and flavor of mandarins, and therefore it is crucial to define the optimal minimum safe temperature for each mandarin variety. Furthermore, massive accumulation of terpenes is most likely the cause for the decrease in flavor acceptability of 'Odem' mandarins after storage at low chilling temperatures.