

**Title** Improving taste and peel color of early-season Satsuma mandarins by combining high-temperature conditioning and degreening treatments

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### **Abstract**

Satsuma mandarin is the earliest variety to appear at the beginning of the citrus harvesting season. However, the fruit cannot be harvested until its internal quality meets the minimum criteria required for export and marketing, i.e., total soluble solids (TSS) levels above 9.0%, acidity levels below 1.3% and ripening ratio (TSS/acidity ratio)  $\geq 7$ . In a previous study [Burdon et al., 2007. Postharvest conditioning of Satsuma mandarins for reduction of acidity and skin puffiness. *Postharvest. Biol. Technol.* 43, 102–114], high-temperature conditioning (HTC) at 30 °C for 3–5 d significantly reduced juice acidity levels. In the present study, we confirmed that HTC for 5 d at 30 °C reduced juice acidity levels in early-season ‘Miho’ Satsuma mandarins by 0.3–0.5%, which resulted in an increase in ripening ratio from 5.5–6.0 at harvest to 7.5–8.0. Furthermore, we evaluated the possible combination of HTC and ethylene degreening treatments, in order to enable simultaneous acceleration of peel color development and reduction in juice acidity levels. Initial laboratory experiments revealed that peel color change was controlled solely by exposure to ethylene, whereas exposure to high temperatures primarily controlled the decrease in juice acidity levels. Packinghouse experiments in commercial degreening rooms confirmed the effectiveness of the combination of HTC and degreening treatments in accelerating peel color development, reducing juice acidity, and improving fruit sensory quality. The combined treatment did not cause any negative effects regarding incidence of decay and peel disorders, but did increase fruit weight loss. Overall, we showed that combining HTC at 30 °C for 5 d with ethylene degreening provides several major benefits for early-season mandarins: (1) it enables earlier harvesting, thus extending the marketing season; (2) it ensures that the fruit will meet the strict minimum-standard criteria and thus reduce the risk of quality rejection; (3) it improves fruit sensory quality and, therefore, consumer acceptance of early-season fruit. Nevertheless, special care must be taken to avoid excessive weight loss caused by exposure to high temperatures.