Title Impact assessment of vapour heat treatment protocols from Japan and Australia on quality and postharvest behaviour of Indian mangoes

Author Sukhvinder Pal Singh

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Abstract

Postharvest vapour heat treatment (VHT) is the regulatory requirement for Indian mangoes to be exported to Japan. Australia has recently approved VHT as a phytosanitary treatment for mangoes to be imported from Uttar Pradesh state in India. VHT regulatory protocols require the innermost fruit pulp temperature to be maintained at 47.5°C for 30 *min* for Japan and at 46.5°C for 30 min or 47.5°C for 20 min for Australia. Heat treatments are known to exert adverse effects on fruit quality in several fruits including mangoes. The objective of this study was to investigate the impact of VHT on the quality and postharvest behaviour of Indian mangoes. Mature green unripe mangoes of 'Chausa' cultivar were subjected to VHT (47.5°C for 25 min) in a commercial facility which was accredited by the quarantine authorities of India, Australia and Japan in 2011. The treated and control fruit were either directly allowed to ripen at ambient (26±1.8°C; RH 49.3±4.6%) or stored at low temperature (9.7±0.3°C; RH 94.4±1.9%) for 2 and 3 weeks to simulate shipment conditions and then ripened at ambient conditions. *Fruit* quality was assessed for various parameters such as flesh firmness, skin and flesh colour, aroma volatiles, soluble solids concentration, titratable acidity, individual sugars and organic acids, carotenoids profiling, chilling injury, and microbial load. VHT accelerated the rate of fruit ripening and resulted in fruit reaching eating soft stage and skin colouration within 4 days after treatment. 1-MCP (1.0 μL L^{-1}) application immediately after VHT, in order to retard ripening in treated fruit, was not effective to deliver desirable effects in both control and treated fruit. No significant adverse effects of VHT in terms of lenticel damage and starchy lumps in fruit were observed in fruit evaluated either directly after treatment or after storage at low temperature. VHT was effective to reduce the incidence and severity of chilling injury and anthracnose disease in fruit stored for 2 or 3 weeks at 9-10°C. Cold storage retarded the promotional effect of heat treatment on fruit ripening while VHT helped in alleviation of chilling injury. In conclusion, VHT protocol adopted for 'Chausa' mangoes required the fruit to be shipped under refrigerated conditions (9-10°C) to reach the export destinations in acceptable quality allowing adequate shelf-life for distribution and marketing.