

Abstract

During their postharvest handling citrus fruit may be exposed to various anaerobic stresses, which may occur, for example: during quarantine treatments, because of inadequate ventilation in containers and storage rooms, following application of waxes that restrict gas exchange through the peel and after packing the fruit in plastic liners. It is known that mandarins tend to develop off-flavors much more rapidly than other citrus varieties, for reasons that are not yet understood. In this study, we evaluated the physiological responses of 'Murcott' mandarins and 'Star Ruby' grapefruit to anaerobic stresses by exposing them to N₂ atmospheres for 6, 12, 24, 48 or 72 h at 20 °C. It was found that mandarins held in N₂ showed earlier and higher increases in respiration rate than grapefruit, with consequently earlier increases in CO₂ levels in their internal atmospheres. Furthermore, mandarins held in N₂ exhibited higher and earlier increases than grapefruit, in the accumulation of the off-flavor volatiles, ethanol and acetaldehyde in the juice. Unlike grapefruit, mandarins responded to the anaerobic treatment by increasing the production of the stress hormone ethylene. Finally, sensory evaluations indicated that the taste of mandarins markedly deteriorated following exposure to anaerobic conditions and was rated as unacceptable after 48 h in N₂, whereas the taste of grapefruit deteriorated only slightly and was rated acceptable even after 72 h of exposure to N₂. Overall, the data presented herein demonstrate that 'Murcott' mandarins are much more sensitive to exposure to anaerobic stresses than 'Star Ruby' grapefruit, and that this high sensitivity may be partly responsible for the much more rapid decline in their marketability and eating quality after harvest.