

Abstract

Respiratory responses of citrus fruits to controlled atmospheres (CA) are of fundamental importance, since CA treatments can be beneficially used in postharvest handling procedures only when they do not have any detrimental effects on fruit quality parameters. Previous studies evaluated the responses of citrus fruits to low O₂ (2% to 3%) and high CO₂ (<5%) levels over long-term storage. In this study, we evaluated the physiological responses of 'Star Ruby' grapefruits (*Citrus paradisi* Macf., cv. 'Star Ruby') and 'Murcott' mandarins (*Citrus reticulata* Blanco, cv. 'Murcott') to different concentrations of O₂ (5, 10, 15 and 21%) or CO₂ (0, 5, 10, and 20%) at 20°C for a short-term period (1 week). Exposures to reduced O₂ concentrations significantly reduced respiration rates and internal CO₂ levels, but 5% O₂ dramatically increased juice ethanol, and, to a lesser extent, acetaldehyde (AA) accumulation. Mandarins exhibited higher and more rapid responses to reduced O₂ concentrations than grapefruits, as revealed by the accumulation of juice ethanol and AA, two important indicators of anaerobic respiration. Exposures to low O₂ (5-10%) slightly reduced ethylene evolution rates in grapefruits but rather increased their levels in mandarins. Exposure to elevated CO₂ (10-20%) markedly increased respiration rates and internal CO₂ levels, but without significant effects on ethylene evolution. Similarly, mandarins showed earlier increases in respiration rates and internal CO₂ levels than grapefruit, following exposure to elevated CO₂ concentrations. Exposure to elevated CO₂ up to 20% didn't substantially increase juice ethanol and AA. Results indicate that reduced O₂ and elevated CO₂ concentrations affect citrus fruits' respiratory characteristics differently. Possible mechanisms involved will be briefly discussed.