

Title Short-term exposures to reduced O₂ and elevated CO₂ atmospheres differently affect the respiratory characteristics of grapefruit and mandarin

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Citation ISHS Acta Horticulturae 857:331-338. 2010.

Keyword *Citrus paradisi*; *Citrus reticulata*; controlled atmosphere; respiration; acetaldehyde; ethanol; anaerobic respiration

Abstract

Respiratory responses of citrus fruit to controlled atmospheres (CA) are of great importance, since CA treatments can be used in postharvest handling only as long as they do not cause any detrimental effects on fruit quality. In this study, we evaluated the physiological responses of 'Star Ruby' grapefruit (*Citrus paradisi* Macf., 'Star Ruby') and 'Murcott' mandarin (*Citrus reticulata* Blanco, '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). Exposure to reduced O₂ atmospheres greatly reduced respiration rates and internal CO₂ levels, but 5% O₂ dramatically increased juice ethanol, and to a lesser extent, acetaldehyde (AA) levels. Exposure to 5% and 10% O₂ reduced ethylene evolution rates in grapefruit but increased their levels in mandarin. Exposure to 10% and 20% CO₂ markedly increased respiration rates and internal CO₂ levels, but reduced ethylene production. Exposure to 20% CO₂ substantially increased juice ethanol and AA levels as compared with air controls, but to a less extent as compared with exposure to 5% O₂ atmosphere. Mandarin exhibited stronger and more rapid responses to reduced O₂ than grapefruit, as revealed by the accumulation of juice ethanol and AA, two important indicators of anaerobic respiration. Mandarin also showed earlier and higher increases in respiration rates and internal CO₂ levels than grapefruit following exposure to elevated CO₂. Results indicate that reduced O₂ and elevated CO₂ atmospheres affect citrus fruit' respiratory characteristics differently. The possible mechanisms involved are briefly discussed.