

Abstracts

Metabolic response of carrots and parsnips to controlled and modified atmospheres

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Low O₂ and elevated CO₂ is not recommended for storage of carrots and parsnips as the benefits are limited. However, there is a growing interest in modified atmosphere packaging of root crops to prevent rooting and sprouting, and enzymatic browning. The O₂ and CO₂ limits for root crops are not well investigated and injurious levels may result in increased respiration rate, fermentative metabolism, and off-odor production. The aim of the present study was to determine the metabolic response of fresh carrots and parsnips to controlled and modified atmosphere storage by use of volatile emission analyses. Carrots and parsnips were stored for 26 days at 5°C either in glass jars covered with needle perforated film inside chambers flushed with atmospheric air (control), 3% O₂, 15% O₂ + 5% CO₂, or 6% O₂ + 14% CO₂ (controlled atmospheres, CA) or inside 1-kg bags (modified atmospheres, MA). The respiration rate was higher in carrots and parsnips stored at elevated CO₂ concentrations (15% O₂ + 5% CO₂ and 6% O₂ + 14% CO₂) than in atmospheric air and 3% O₂. Storage in 3% O₂ and 6% O₂ + 14% CO₂ resulted in elevated acetaldehyde and ethanol concentrations and development of off-odors in fresh carrots and parsnips. Fermentative odors also developed in parsnips following storage in 15% O₂ + 5% CO₂ and in MA down to 10.3% O₂ and up to 17.5% CO₂. In contrast, no fermentative odors developed in carrots stored at 15% O₂ + 5% CO₂ and in MA down to 17.2% O₂ and up to 4.8% CO₂. The results showed that parsnips are more sensitive than carrots to low O₂ and elevated CO₂ and that volatile emission analyses give valuable information on fresh produce tolerance to controlled and modified atmosphere storage.

Keywords: Volatile organic compounds, volatile emission, off-odors, metabolic response, root crops.