

Abstract:

To investigate the effect of ozone and 1-MCP treatments on quality of carrot, fresh carrots were treated with or without $1.0 \mu\text{l}\cdot\text{L}^{-1}$ 1-methylcyclopropene (1-MCP) for 16 h before storage or after 12 weeks of storage at 0°C , and then exposed to 0, 300, or $1,000 \text{ nl}\cdot\text{L}^{-1}$ ozone at 10°C for 0, 1, 2, or 4 days. The carrots were then stored at 0°C for up to 24 weeks. Decay and mold incidence, electrolyte leakage, surface discoloration and 6-methoxymellein (6-MM, also known as isocoumarin) content in the peel tissue of carrots were evaluated. While no decay of the roots was observed, the incidence of saprophytic mold on the crowns was reduced during the first 8 weeks of the study, following the $300 \text{ nl}\cdot\text{L}^{-1}$ ozone treatments of 1, 2, or 4 days. A similar effect was found on the carrots treated after 12 weeks. The $1,000 \text{ nl}\cdot\text{L}^{-1}$ ozone treatments for 2 or 4 days caused severe tissue injury resulting in the highest mold incidence of 65% after 24 weeks of storage. The $1,000 \text{ nl}\cdot\text{L}^{-1}$ ozone also induced a greater rate of electrolyte leakage in the peel and caused surface discoloration. The discoloration index, using a scale of 0-2, was 1.55 compared with 0.3 for those treated with $300 \text{ nl}\cdot\text{L}^{-1}$ ozone. 6-MM, which causes bitterness, was affected by the concentration of ozone and the treatment time. Treatments of 300 and $1,000 \text{ nl}\cdot\text{L}^{-1}$ ozone for 4 days induced 6-MM production in carrot peels reaching concentrations as high as 167 and $365 \mu\text{g}\cdot\text{g}^{-1}$, respectively, and the accumulation of 6-MM increased during storage. Treatment with 1-MCP effectively reduced 6-MM accumulation induced by the ozone treatments. The concentration of 6-MM remained below $150 \mu\text{g}\cdot\text{g}^{-1}$ in carrots treated with 1-MCP and $1,000 \text{ nl}\cdot\text{L}^{-1}$ ozone for 4 days.