

1*H*-cyclopropabenzene and 1*H*-cyclopropa[*b*]naphthalene fumigation suppresses climacteric ethylene and respiration rates and modulates fruit quality in long-term controlled atmosphere-stored ‘Gold Rush’ pear fruit

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Abstract

‘Gold Rush’ pear (*Pyrus communis* L.) is a russet-coloured fruit with soft buttery textured flesh and is gaining wide popularity in Australia and other countries along with other pear cultivars. The fruit are sensitive to ethylene, and exposure even at very low concentrations significantly reduces the storage duration as well as fruit quality during storage. The efficacy of two new ethylene antagonist compounds, namely, 1*H*-cyclopropabenzene (BC) and 1*H*-cyclopropa[*b*]naphthalene (NC), as well as 1-methylcyclopropene (1-MCP) in regulating ethylene production, respiration rates and maintaining the fruit quality of ‘Gold Rush’ pear during 150 d and 200 d of controlled atmosphere (CA) storage ($2.3 \pm 0.5\%$ O₂ and $0.4 \pm 0.15\%$ CO₂ and 0.50 ± 0.71 °C) was investigated. The pear fruit was fumigated with 1 μM BC ($0.09 \mu\text{L L}^{-1}$) or 1 μM NC ($0.14 \mu\text{L L}^{-1}$) or 18 μM 1-MCP ($1 \mu\text{L L}^{-1}$) for 18 h at room temperature and the untreated fruit was considered as the control. Following 150 d and 200 d CA storage, the fruit fumigated with BC and NC exhibited significantly reduced ethylene and respiratory climacteric peak rates and they were lowest in the fruit treated with 1-MCP. The pear fruit fumigated with ethylene antagonists (BC, NC and 1-MCP) exhibited lower physiological loss of weight (PLW) (up to 2.06 times) and higher fruit firmness (up to 1.07 times) throughout the CA storage period, compared to the control fruit. The fruit fumigated with BC and NC had lower levels of SSC, glucose and sorbitol compared to other treatments. There was no significant effect of ethylene antagonist treatments on levels of individual organic acids, total phenols, ascorbic acid and total antioxidant capacity of the fruit pulp. Therefore, new ethylene antagonist compounds, BC and NC, exhibit the potential to act as ethylene antagonists in long-term CA-stored ‘Gold Rush’ pears

to retard the fruit ripening process, extend storage life and maintain the fruit quality. The effectiveness of the different concentrations of BC and NC in suppressing ethylene production in different cultivars of pears warrants further investigation.