

# 1*H*-cyclopropabenzene and 1*H*-cyclopropa[*b*]naphthalene fumigation downregulates ethylene production and maintains fruit quality of controlled atmosphere stored ‘Granny Smith’ apple

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## Abstract

The ‘Granny Smith’ is a commercial apple cultivar in Western Australia and popular in the apple world as well, for its unique green colour and flavour. The effects of two new ethylene antagonists namely 1*H*-cyclopropabenzene (BC) and 1*H*-cyclopropa[*b*]naphthalene (NC), as well as 1-methylcyclopropene (1-MCP) on ethylene production, rates of respiration and fruit quality were investigated in controlled atmosphere (CA) stored ‘Granny Smith’ apple. The apple fruit were fumigated with 1  $\mu\text{M}$  BC ( $0.09 \mu\text{L}\cdot\text{L}^{-1}$ ) or 1  $\mu\text{M}$  NC ( $0.14 \mu\text{L}\cdot\text{L}^{-1}$ ) or 18  $\mu\text{M}$  ( $1 \mu\text{L}\cdot\text{L}^{-1}$ ) 1-MCP for 18 h at room temperature ( $20 \pm 2 \text{ }^\circ\text{C}$  and  $65 \pm 5\%$  RH). Following 90 d and 120 d of CA storage ( $2.5 \pm 0.64\%$   $\text{O}_2$  and  $1.3 \pm 0.45\%$   $\text{CO}_2$  at  $0 \pm 1 \text{ }^\circ\text{C}$ ), fumigation treatments with 1-MCP, NC and BC effectively suppressed and delayed climacteric peaks of ethylene and respiration as compared to the control fruit. The 1-MCP treatment was relatively more efficient in reducing the rates of ethylene and respiration climacteric peaks than BC and NC. But all the treatments reduced physiological loss of weight (PLW) (up to 1.38 times) and maintained higher fruit firmness (up to 1.16 times), total phenols (up to 1.53 times) and ascorbic acid (up to 1.15 times), compared to the control, following the CA storage period. Therefore, BC and NC possess the potential to act as ethylene antagonists in CA stored ‘Granny Smith’ apples to retard fruit ripening process and maintain the fruit quality. The effects of different concentrations of BC and NC in antagonising the ethylene action in different cultivars warrants further investigation in CA stored apple fruit.