Characterization of ethylene biosynthesis and its regulation during fruit ripening in kiwifruit, *Actinidia chinensis* 'Sanuki Gold'

Abstract

Ethylene biosynthesis in kiwifruit, *Actinidia chinensis* 'Sanuki Gold' was characterized using propylene, an ethylene analog, and 1-methylcyclopropene (1-MCP), an inhibitor of ethylene perception. In fruit harvested between a young stage (66 days after pollination) (DAP) and an early commercial harvesting stage (143 DAP), 2 days of exposure to propylene were sufficient to initiate ethylene biosynthesis while in fruit harvested at commercial harvesting stage (154 DAP), 4 days of propylene treatment were required. This observation suggests that response of ethylene biosynthesis to propylene treatment in kiwifruit declined with fruit maturity. Propylene treatment resulted in up-regulated expression of *AC-ACO1*, *AC-ACO2*, *AC-SAM1* and *AC-SAM2*, prior to the induction of *AC-ACS1* and ethylene production, confirming that *AC-ACS1* is the rate limiting step in ethylene biosynthesis in kiwifruit. Treatment of fruit with more than 5 $\mu L\ L^{-1}$ of 1-MCP after the induction of ethylene production subsequently suppressed ethylene production and expression of ethylene biosynthesis genes. Treatment of fruit with 1-MCP at harvest followed with propylene treatment delayed the induction of ethylene production and *AC-ACS1* expression for 5 days. These observations suggest that in ripening kiwifruit, ethylene biosynthesis is regulated by positive feedback mechanism and that 1-MCP treatment at harvest effectively delays ethylene production by 5 days.