

# Genome wide identification of superoxide dismutase (*SOD*) genes and their expression profiles under 1-methylcyclopropene (1-MCP) treatment during ripening of apple fruit

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## Abstract

The objective of this research was to determine the role that ethylene plays in superoxide dismutase (*SOD*) gene expression of apple fruit (*Malus × domestica* Borkh.) during ripening. Apple fruit at commercial maturity were treated with ethylene antagonists 1-methylcyclopropene (1-MCP) and stored at shelf temperature of 20 °C. Our data indicated that application of 1-MCP resulted in a reduced rate of softening and a delayed peak of ethylene and respiration. 1-MCP treatment reduced accumulation of superoxide anion ( $O_2^{\cdot-}$ ) and hydrogen peroxide ( $H_2O_2$ ) in both peel and pulp, enhanced *SOD* activity in pulp and peel to varying degrees during ripening. Expression of *Cu/ZnSOD2*, *Cu/ZnSOD3*, *Cu/ZnSOD5*, *Cu/ZnSOD6*, *Cu/ZnSOD8*, *MnSOD2*, *MnSOD7* and *MnSOD9* in pulp was enhanced by treatment with 1-MCP during the early ripening period, and conversely, their expression in pulp was reduced by it during the late ripening period compared to control group. Most *SOD* genes presented a fluctuating pattern of expression in peel after 1-MCP treatment during ripening. Expression of *Cu/ZnSOD10* and *MnSOD7* in peel was promoted by 1-MCP treatment during the late ripening period, while expression of *MnSOD4* and *FeSOD1* in peel was generally enhanced by it during the entire shelf life period compared with controls. Our results suggested that ethylene played a role in regulating *SOD* genes expression in both pulp and peel of ripening apple fruit.