

Effects of precooling time and 1-MCP treatment on ‘Bartlett’ fruit quality during the cold storage

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Abstract

‘Bartlett’ is one of the consumer’s favorite pears due to its juicy, delicate texture, and excellent flavor; however, the short storage life of the fruit limits its market value. One main factor affecting fruit quality is the early peel yellowing. In this study, the effects of the delayed precooling and 1-MCP treatment on the fruit quality were investigated. For the delayed precooling treatment, the fruit were held at 20 °C for 0, 12, and 24 h before they were moved to a cold storage (−1 °C). For the 1-MCP treatment, the fruit were exposed to 1-MCP at 0.3 µL/L for 24 h in the cold storage. After 1-MCP treatment, all fruits were stored at −1 °C and evaluated over a 6-month period. Results showed that delayed precooling of the field harvested fruit significantly extended the fruit cooling rate. Treatment with 1-MCP significantly inhibited the fruit respiration and ethylene production, delayed fruit ripening capacity, retarded chlorophyll degradation and eliminated senescence scald; however, these effects were not observed in the non-1-MCP treated fruit. Expression of the ethylene synthesis genes (*PcACS1*, *PcACS4*, *PcACS5*, and *PcACO1*) and receptor genes (*PcETR1*, *PcETR2*, and *PcERS*) was dramatically increased by delayed precooling time, but their expression was suppressed by 1-MCP treatment. Two genes (*PcACS5* and *PcETR1*) were hierarchical among controls 0, 12 and 24. In contrast, the *PcACS2* gene was upregulated by 1-MCP. The transcription level of the chlorophyll degradation genes *PcPPH*, *PcSGR1*, *PcRCCR*, and *PcNYC* was increasing in the non-1-MCP treated fruit, but inhibited by 1-MCP treatment during the cold storage time and the inhibition level was negatively related to the delayed precooling time. The expression of *PcPAO* and *PcCHL1* dramatically decreased in the non-1-MCP treatments and little effect of 1-MCP treatment on their expression was observed. In conclusion, 0 h of delayed precooling time or 1-MCP treatment prevented peel yellowing and extended storage life of ‘Bartlett’; however, 1-MCP treatment delayed fruit ripening and the fruit required 14 days at 20 °C to ripen following 4–6 months of storage.