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LOW-TEMPERATURE MODULATED FRUIT RIPENING IN THREE KIWIFRUIT CULTIVARS

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Abstract

Kiwifruit is classified as climacteric fruit as exogenous ethylene induces fruit ripening. However, we recently found that 'Sanuki Gold' (SG) fruit stored at low temperature (5°C) ripened faster than fruit at room temperature (22°C) unless ethylene was induced by disease development. Some ripening related genes were stimulated at 5°C but not at 22°C. In order to know whether low temperature ripening is common in kiwifruit or not, and to understand temperature response in detail, early-maturing cultivar 'Rainbow Red' (RR), SG and late-maturing cultivar 'Hayward' (HW) at commercial maturity were stored at 5, 10, 15 or 22°C with or without 1-MCP treatment for 8 weeks. Fruit producing ethylene were eliminated from the experiment. Another group of fruit were treated with propylene (5000ppm) and used as ethylene-ripening fruit. Expression of several ripening-associated genes was compared in fruit stored at various temperatures and fruit treated with propylene. Ethylene biosynthesis genes, ACO1 and ACS, were significantly induced by only propylene treatment in the three cultivars, in parallel with induction of ethylene biosynthesis. Interestingly, ACO3 was induced by low temperature (5°C, 10°C, 15°C) but not by propylene. Cell wall modifying genes, PG and EXP1, were induced by both propylene treatment and low temperature, accounting for fruit softening. During storage, their expression increased as storage temperature decreased. The expression of PMEi was also accelerated by low temperature in the three cultivars. β -Amy2 was induced only by propylene treatment, corresponding to increase of SSC, while β -Amy5 was significantly stimulated by low temperature exposure. Transcription factors, ERF6 and CH1, were induced by only propylene treatment. MADS8c were induced only by low temperature and two NAC genes (4, 10b) were induced by both stimuli.

Expression profiles of ripening associated genes in response to low temperature and propylene were similar in three cultivars, suggesting that the low temperature-modulated ripening is common in kiwifruit.

Key words: kiwifruit, cultivar, storage life, low temperature, ethylene