

Effects of postharvest temperature on apoptosis-related enzyme activity and gene expression in peach fruits (*Prunus persica* L. cv. Xiahui 8)

Xiujuan An, Yin Xu, Li Jiang, Chen Huan and Zhifang Yu

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Abstract

Peach fruits are inevitably affected by rapid ripening and senescence after harvest, leading to the relatively quick deterioration of fruit quality. Although previous studies have confirmed that temperature influences fruit ripening and senescence, information regarding apoptosis in stored peach fruits is limited. Moreover, the relationship between apoptosis and ripening and senescence has not been characterized. In this study, peach fruits (*Prunus persica* L. cv. Xiahui 8) were stored at room temperature (25 °C) or under cold conditions (4 °C) for 8 and 20 days, respectively. The effects of the two temperatures on fruit cell apoptosis as well as the activity of apoptosis-related enzymes and the associated gene expression levels were investigated. Flow cytometry data indicated that the apoptosis of peach fruit cells was delayed more at 4 °C than at room temperature. This observation was supported by an analysis of the activities of apoptosis-related enzymes (i.e., serine protease, lipoxygenase, superoxide dismutase, peroxidase, and catalase). Additionally, serine protease activity, which directly affects apoptosis, exhibited the greatest temperature-induced changes. Moreover, RNA-sequencing and iTRAQ results confirmed that storage temperature affects the expression levels of the genes encoding the abovementioned apoptosis-related enzymes. The observed temperature effects on peach fruit ripening and senescence from the perspective of apoptosis may be relevant for clarifying the molecular mechanism responsible for fruit ripening and senescence and for improving fruit storage techniques.