

Title UV-C irradiation delays strawberry fruit softening and modifies the expression of genes involved in cell wall degradation

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Abstract

Exposure to UV-C delays fruit softening, one of the main factors determining fruit postharvest life. This softening delay might be caused by changes in the activities of enzymes and proteins involved in cell wall disassembly. Expansins, polygalacturonases (PGs), endoglucanases (EGs) and pectin-methylesterases (PMEs) are cell wall proteins or enzymes involved in fruit softening. In this work, we analyzed the expression profiles of these genes during ripening of strawberries (*Fragaria × ananassa*, Duch. cv Aroma) and found a correlation between messenger RNA levels and firmness of Aroma cultivar. In addition, strawberries (*Fragaria × ananassa*, Duch. cv Aroma) at 50% red ripening stage were harvested and then irradiated with a non-lethal UV-C dose (4.1 kJ m^{-2}). Treated and control fruit were stored at 20 °C during 96 h. Fruit firmness, expression of genes encoding cell wall degrading enzymes and proteins, and the enzyme activity of PG, endoglucanase and PME were analyzed. UV-C treatment delayed fruit softening, and treated fruit showed higher firmness than controls even 96 h after irradiation. The irradiation modified the expression of the genes and the activity of assayed enzymes. In general, the expression of analyzed genes was reduced a few hours after irradiation, while it increased afterwards to reach similar or higher levels than the controls. The expression of three expansins (*FaExp2*, *FaExp4* and *FaExp5*) was reduced 4 h after irradiation. The expression of *FaPG1* was lower in irradiated fruit after 8 h. The amount of *FaCell1* transcript was reduced even after 24 h. At different times, the enzyme activities (PG, endoglucanase, PME) remained at a similar or lower level than in non-irradiated fruit. Therefore, the effect of UV-C irradiation on strawberry fruit softening could be related to the decrease of the transcription of a set of genes involved in cell wall degradation, during the first hours after treatment.