The biochemical and molecular mechanisms of softening inhibition by chitosan coating in strawberry fruit (*Fragaria* x *ananassa*) during cold storage

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Abstract

Strawberry fruit is extremely perishable at least partially because of excessive softening, which can be inhibited by edible chitosan coating during ripening, but the biochemical and molecular mechanisms are not completely understood in the fruit under cold conditions. Here, changes in levels of quality attributes, cell wall constituents, activities and expression of cell wall modifying enzymes, were evaluated in strawberry fruit treated with 1.5% (w/v) chitosan coating and stored at 4 °C for 12 days. Chitosan coating had a significant inhibitory effect on fruit softening during cold storage, rather than other quality attributes. Chitosan coating treated fruit showed the reduction in the content of water-soluble pectin coincident with significant inhibition in activities of polygalacturonase (PG) and pectin methylesterase (PME), and expression of *FaPG1*and *FaPME1*, relative to the controls. Activities of these two enzymes and expression of *FaPG1* were significantly correlated with the contents of water-soluble pectin. Besides, the decreased link between cellulose and hemicellulose was indicated by the reduced transcript levels of *FaXTH1* and *FaEXP2*, with significantly positive correlation. In conclusion, the effect of chitosan coating on strawberry fruit mainly involves the softening inhibition by metabolic enzymes of pectin, especially PG and PME. The results will provide insights into developing measures to control strawberry fruit softening during cold storage and cold chain logistics.