

**Title** Preharvest calcium applications inhibit some cell wall-modifying enzyme activities and delay cell wall disassembly at commercial harvest of 'Fuji Kiku-8' apples

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### **Abstract**

To improve apple firmness during the postharvest chain, detailed knowledge of the biochemistry underlying ripening-related cell wall disassembly, a very complex event, is required. Apple softening is reportedly mediated by calcium loss from the middle lamella, and accordingly calcium applications are expected to preserve fruit firmness. In this work, pre-harvest calcium sprays (7 weekly applications at 1.6%, w/v, 81–123 days after full bloom) were applied to 'Fuji Kiku-8' apples, with the purpose of examining treatment effects on cell wall metabolism during on-tree fruit maturation and ripening. Applied calcium improved cell-to-cell adhesion as indicated by better preservation of the middle lamella and by higher contents of ionically bound pectins in treated fruit, leading to higher fruit firmness levels at commercial harvest. Matrix glycan breakdown was also delayed in response to calcium treatment. Calcium applications partially suppressed pectinmethylesterase, pectate lyase,  $\beta$ -galactosidase,  $\alpha$ -L-arabinofuranosidase and  $\beta$ -xylosidase activities, without any apparent relationship with ethylene production rates.