

Title Firmness decline in 'Gala' apple during fruit development.
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Abstract

Puncture force was measured in 'Gala' apple (*Malus sylvestris* var. *domestica* [*M. pumila*]) fruits from 16 to 175 days after full bloom over 2 years using a range of circular flat-tipped probes (1 to 11 mm diameter) to test the firmness of each fruit. The area-dependent (K_a) and perimeter-dependent (K_p) coefficients of puncture force were determined and were used to calculate the indicative puncture force approximating a standard 11.1-mm-diameter Effegi/Magness-Taylor probe for even the smallest fruit. K_a declined exponentially throughout fruit development with much greater changes occurring closer to bloom. In contrast, maximum K_p occurred at 107 to 119 days after full bloom before declining progressively. Estimated firmness (using a 11.1-mm-diameter probe) declined constantly from 16 days after full bloom. K_a was associated with developmental changes in cortical tissue intercellular air space, cell volume and cell packing density although relationships changed throughout fruit growth. However, seasonal change in K_p was not associated with any obvious anatomical change in the cortex.