

**Title** The effect of fruit factors on the bruise susceptibility of apples  
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**Citation** Postharvest Biology and Technology, Volume 46, Issue 1, October 2007, Pages 10-19  
**Keywords** Bruise; Fruit; Apple; Mechanical damage; Modelling; Discrete element; Regression models

### **Abstract**

Bruise prediction models which are essential for the applicability of the discrete element method (DEM) to simulate bruise damage during fruit transport and handling are discussed. Bruise prediction models relate the contact force during impact, as calculated by DEM through contact force models, with the real bruise damage. Apart from DEM, bruise prediction models can provide useful information about the influence of fruit factors (e.g. ripeness) on bruise susceptibility, leading to recommendations for fruit handling. Regression models were built with impact energy or peak contact force as independent variables. Advantages and disadvantages of both models are discussed. Bruise prediction models were constructed for the apple cultivar 'Jonagold', with impacts controlled by a pendulum. Multiple linear and nonlinear regression models were built to link fruit factors such as ripeness, acoustic stiffness, fruit temperature, radius of curvature and harvest date, with bruise damage. Bruise volume was used as a measure for apple bruising. Significant main effects and significant interactions between fruit factors were identified. Interactions between fruit factors (e.g. interaction between harvest date and stiffness), along with interactions between fruit factors and the degree of bruising, were identified. Most of the effects of those fruit factors on bruise damage could be explained by applying theoretical bruise models described in the literature.