

Title            The discrete element method (DEM) to simulate fruit impact damage during transport and handling:  
Model building and validation of DEM to predict bruise damage of apples

Author          M. Van Zeebroeck, E. Tijskens, E. Dintwa, J. Kafashan, J. Loodts, J. De Baerdemaeker and H. Ramon

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### **Abstract**

The validity of the discrete element method (DEM) as a tool to predict impact damage of fruit was investigated for 'Jonagold' apples. 'Bruise damage' was preferred over the 'particle trajectory' as the validation parameter. The bruise damage of apples in boxes shaken with a well defined acceleration signal on an electro-hydraulic shaker was compared with the bruise damage calculated from DEM simulations with the same initial conditions. The parameters for the contact force models, needed as input for the simulations, and the bruise prediction model were determined on the same batch of apples, utilized in the validation experiments. The validations indicated that DEM can predict in an acceptable way apple bruise damage (bruise depth). However, due to the lack of the possibility of saving the impact positions on the apple surface by means of a coordinate system no prediction of multi-impact bruise surface and volume could be obtained.