

# Bruise susceptibility and energy dissipation analysis in pears under impact loading conditions

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Postharvest Biology and Technology, Volume 163, May 2020, 111120

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## Abstract

The relationship between bruise susceptibility and internal damage energy with impact velocity has been investigated using two pear cultivars. Bruise susceptibility of both pear cultivars increased with the increasing impact velocity, stabilizing at the highest impact velocity of  $3 \text{ cm}^3 \text{ J}^{-1}$ . Internal damage energy also increased with higher impact velocity. The internal damage energy was close to 0 for impact velocities at which pear bruising did not occur. The bruise depth and width measured 48 h after the impact, as well as the peak deformation and contact width directly during the impact were also determined. For the three largest velocities ( $1\text{-}1.5 \text{ m s}^{-1}$ ) the bruise depth was 2.5 times larger than the peak deformation. For the same velocities the contact width was 1.4 times greater than the bruise width which can lead to erroneous estimation of critical stress from the bruise width. The impact results recorded by means of high speed camera were analyzed using Tema Motion software to obtain displacement and velocity in time. Additionally, the software allowed calculating the contact width of the pear with a flat rigid plate at any time of impact.