Title Factors that affect tomato bruise development as a result of mechanical impact

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Abstract

External and internal factors that affect tomato bruise susceptibility such as impact- and fruit-related properties were investigated. Logistic regression was used to establish a relationship between tomato loading conditions and the resulting damage. Impact-specific models were built for a more precise determination of the bruise risk related to a narrow range of impact energies, being low (23 mJ), medium (71 mJ), high (158 mJ) and very high (216 mJ) impacts.

Pericarp tissue over the locules was much more sensitive to bruise development than radial wall tissue. Tomatoes at room temperature (20 °C) were more sensitive than fruit stored at 12 °C. Tomato susceptibility to bruising increased substantially with ripening and loading conditions. The duration of the impact played a critical role in the bruise development and it is largely determined by fruit intrinsic parameters. Additional effects of the restitution coefficient and the fruit mass were found. Finally, different factors are responsible for tomato bruising in the various impact classes. The effect of low and medium energy impacts is largely controlled by the fruit texture. Especially medium impacts seem to substantially increase the bruise potential. The bruise potential of high and very high impacts mainly depends on fruit ripeness and the location of impact.

Abbreviations: B, bruise (0/1); BR, breaker stage; CI, confidence interval; CT, cold temperature = 12 °C; CW, cross wall or radial wall or septum; D_{min}, minimum diameter (mm); D_{max}, maximum diameter (mm); E_i, impact energy (mJ); E, elasticity (N/ms); f, natural frequency (Hz); F_{max}, maximum force at contact (N); L, locule; locular tissue; m, mass (g); OR, orange red stage; PI, pink stage; place, location of impact; R_c, restitution coefficient; RR, red ripe stage; RT, room temperature = 20 °C; S, stiffness or acoustic firmness (10^6 Hz^2 $g^{2/3}$); t, contact duration of the impact (ms); T_{Peric}, thickness of the pericarp tissue (mm)