Abstract

The effects of humidity and temperature on firmness of ‘Tradiro’ tomato were studied to discriminate between the effect on the biochemical process of cell wall breakdown and the effect on the physical process of water loss. Firmness was evaluated using an invasive puncture test and non-invasive compression force and acoustic firmness measurements on tomatoes stored at 12–23 °C and 30–100 % relative humidity (RH). The rate of softening of tomato measured using the invasive technique depended only on temperature, whereas the rates of softening measured using the non-invasive techniques depended on both temperature and the applied water vapour pressure deficit (WVPD).

By modelling the data it was demonstrated that the softening measured by non-invasive techniques has two components—an autocatalytic enzymatic process and an exponential process driven by the WVPD, explaining 97 % of the observed variation.

Together with literature data on pear and apple, a strong case is presented to support the hypothesis that acoustic firmness is largely a measure of the mechanical stiffness of the tissue, which is based on both the mechanical strength of the cell wall and the tension under which the tissue is held by turgor pressure.