

Title Prediction of firmness change in "Cripps Pink" apple during storage
Authors T. Van Pham, R. McConchie, S. Morris, D. Tanner, R. Herbert
Citation ISHS Acta Horticulturae 803:319-326. 2008.
Keywords softening; modeling; non-linear regression; exponential model; Arrhenius equation; simulation

Abstract

A range from 0°C to 3°C is recommended as the optimal temperature for regular air cold storage of apples. However, it is difficult to maintain a consistent temperature throughout the supply chain after harvest. Equipment failure or sub-optimal handling can expose the fruit to undesired temperatures for different periods of time and can cause unpredictable loss of quality. Our aim was to study post-harvest responses in flesh softening of 'Cripps Pink' apple (*Malus domestica* Borkh.) to a range of handling temperatures from 0°C to 30°C, to establish the best model to characterize the softening process and predict firmness change in the apples. The apples were stored under regular air at three temperatures. Firmness was recorded periodically during storage time. Data analyses were performed using GenStat statistical software, version 8.2, 2005 and the modeling firmness change was conducted using GraphPad Prism software, version 4.03, 2005 for non-linear regression with Least-Squares method to determine estimates of parameters. An exponential decay model with parameters describing firmness of the apples at different temperatures change with time was established and tested with firmness data sets of the same apple cultivars but differences in growing region and season. The results indicated that firmness was strongly dependent on temperature and reduced exponentially with time. The rate of softening increased substantially with temperature. The variance accounted for by the model in non-linear regression analysis was 97.45%. Results of the model testing showed that the predictions of the model were in good agreement with the other experimental data. The model can help to predict quality changes during shipment and storage as well as final outturn quality of the product. This knowledge will also assist in managing supply chain logistics and marketing activities of the apples.