

Abstract

Tomato fruit (cultivar Belissimo) were harvested at three different stages of ripening, sliced and stored at 2, 5, 8, 12 and 16 °C. Firmness was measured as the force necessary to cause a deformation of 3 mm, in the outer and the radial pericarp, daily or every two days, depending on the combination of stage of ripening and temperature. For constructing a model, firmness was considered to be built up by a variable part (e.g. pectin based firmness) that changes according to a first order reaction mechanism and a fixed part (e.g. cellulose or structure based firmness) that is invariable under the circumstances under study.

The firmness of the tomato slices decreased exponentially during storage, with a reference rate constant of 0.0975 ± 0.0183 J/mol/K for the outer pericarp and 0.0712 ± 0.0328 J/mol/K for the radial pericarp and energy of activation of 87.5 and 94.8 kJ/mol, respectively for outer and radial pericarp. The parameters of the model were estimated using multiple variate non-linear regression analysis with time, temperature and stage of ripening of the fruit at harvest simultaneously as explanatory variables. To combine the information on firmness behaviour during the preharvest and the postharvest period at different temperatures, it was assumed that the process of firmness loss during ripening was the same whether the fruit ripened on the plant or off-vine. So, the initial firmness at the postharvest period depends on the time the tomatoes were allowed to ripen on the plant (stage of ripening). The statistical analysis of the mean values of firmness provided a percentage variance which accounted for 92% and 72% for outer and radial pericarp, respectively. Using a fundamental approach to build the reported model and using all available data and information made it possible to describe and simulate the firmness behaviour of tomato slices as a function of the stage of ripening and the applied storage temperature.