Title	The firmness of stored tomatoes (*cv. Tradiro*). 2. Kinetic and Near Infrared models to describe pectin degrading enzymes and firmness loss
Author	C. Van Dijk, C. Boeriu, T. Stolle-Smits and L.M.M. Tijskens
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Abstract

Tomatoes (*cv. Tradiro*), harvested at two maturity stages, were stored at four different temperatures during up to four weeks. The lowest storage temperature was known to cause chilling injury, the three other temperatures were regarded save. During storage Near Infrared spectra of intact tomatoes were recorded and samples were taken at regular time intervals to determine the activities of the pectolytic enzymes polygalacturonase, pectin methyl esterase and β-galactosidase. The maturity stage of the tomatoes at harvest, followed by storage at the four different temperatures affects the activities of these enzymes. To describe the change in activity of these enzymes kinetic models were built based on fundamental laws of chemical kinetics using assumed, but plausible reaction mechanisms. For the models developed, a fixed and a variable enzyme activity were observed for these three enzymes. For polygalacturonase, this fixed amount of enzyme activity was dependent on maturity stage at harvest. For pectin methyl esterase and β-galactosidase the maturity at harvest had almost no effect on this fixed amount of enzyme activity. The variable part of the enzyme activity could either increase in time (polygalacturonase), followed by denaturation (β-galactosidase), or only decay in time (pectin methyl esterase). For the activity of polygalacturonase, a self-initiated, autocatalytic production of this enzyme was assumed. β-Galactosidase was formed, but inactivated in time. Pectin methyl esterase activity decayed exponentially in time.

The models for polygalacturonase and β-galactosidase were integrated into the previously developed model for the firmness loss of tomatoes during storage [Van Dijk, C., Boeriu, C., Peter, F., Stolle-Smits, T., & Tijskens, L. M. M. (2005). The firmness of stored tomatoes (*cv. Tradiro*). 1. Kinetic and Near Infrared models to describe firmness and moisture loss. *Journal of Food Engineering*, in press]. It was concluded that any cell wall degrading enzyme, which activity remains within a certain bandwidth, can be integrated into the firmness model to explain the observed firmness decay.

Based on Near Infrared spectroscopy, a statistical significant relation was only observed between the polygalacturonase activity and the Near Infrared spectra of intact tomatoes. It is argued that the consequences of the performed polygalacturonase activity are reflected in this relation rather than the amount of this enzyme.

Since mutual statistical significant relations exist between Near Infrared spectra, polygalacturonase activity and the tomato firmness it seems reasonable to ascribe a significant role of this enzyme to the firmness decay.