Title Modelling the firmness behaviour of cut tomatoes

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Abstract

Firmness is one of the main quality attributes of sliced tomatoes. Here, a physiology-based mechanism is proposed that describes the development of firmness as measured by limited compression. The mechanism assumes that softening of slices is radically different from that of whole tomatoes and depends on the stage of ripening at slicing. During slicing the pericarp solubility will quickly increase because of exposure to, amongst others, vacuolar content with a low pH. This exposure will have a more serious effect on the firmness behaviour of ripe sliced tomatoes as in that case the pH will already be lower due to normal ripening. This mechanism has been translated into a kinetic model that describes the individual firmness behaviour over time and a batch model that describes the variation in firmness within batches of slices. Firmness data were recorded for different cultivars as a function of time at different temperatures, initial maturity, type of compression and treatment with ethylene and 1-MCP just before slicing. Both models were well able to describe the trends present in the firmness data, with an average percentage variance accounted for of 89%, despite the high variability in the raw data. The firmness decay due to the wounding was very fast, within 12 h. The effect of the initial maturity on the final firmness level was large. On the other hand, the effect of treating whole tomatoes with ethylene and 1-MCP on the firmness development of slices was minimal. This indicates that for consumer acceptance of sliced tomatoes, tomato cultivars need to be selected with a sufficient final (structural) firmness combined with a thorough assessment of the maturity at slicing.