Can metabolites at harvest be used as physiological markers for modelling the softening behaviour of Chilean "Hass" avocados destined to local and distant markets?

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Abstract

The aim of this study was to model Chilean "Hass" avocado softening behaviour, destined to local and distant markets, taking into account the biological variation given by growing location and harvest stages. A total of 24 batches were obtained during the season 2018–2019 from different agro-climatic zones (coast, intermediate and interior) and two harvest stages (based on dry matter content). Fruit softening during either regular air (RA) or controlled atmosphere (CA) storage at 5 °C followed by shelf-life at 20 °C was modelled using a simplified mechanistic model. Most of the model parameters were treated as being generic for all fruit except for two fruit specific parameters, F_0 (firmness at harvest) and E_0 (amount of enzyme complex at harvest) that characterized the fruit at harvest and thus postharvest ripening behaviour. The model was able to describe 87.6 % of the observed variation of all 24 fruit batches studied from different agro-climatic zones at the batch averaged level, but 93.5 % of the observed variation at the fruit individual level. Since measured at harvest when most fruit are highly firm, initial fruit firmness by itself was not able to discriminate among the various batches as they all showed similar normal distributions among the different agro-climatic zones, in addition, the estimated E_0 values for each individual fruit were correlated to key metabolites to identify potential metabolite biomarkers discriminating among the different regions and batches. The developed model can be utilized to predict the batch specific ripening behaviour of "Hass" avocado under different postharvest logistic chains given the distribution of E_0 is known.