Title Prediction ability of firmness decay models of nectarines based on the biological shift factor measured by time-resolved reflectance spectroscopy

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Abstract

The maturity of nectarines at harvest can be assessed by measuring the absorption coefficient at 670 nm (μ_a) with the non-destructive technique of time-resolved reflectance spectroscopy (TRS). A kinetic model links μ_a, converted into the biological shift factor (BSF), to firmness decrease during ripening; in this way the firmness decay model includes the variations in maturity at harvest, thereby allowing prediction of shelf-life for individual fruit. In order to study how this methodology could be practically used at the time of harvest, when μ_a can be measured non-destructively on all fruit, while the destructive measurement of firmness can only be done on a small sample, various firmness decay models were developed using either data at harvest or within 1–2 d after harvest from previous experimental research with nectarines carried out over a 5-year period. These models were then tested for prediction and classification ability by comparing the predicted firmness and class of usability to the actual ones measured during ripening and their performance compared to that of models based on data during the whole shelf-life. Our results suggest that the methodology might be used as a management tool in the nectarine supply chain. Independently from the actual softening rate, the classification at harvest based on μ_a is able to segregate fruit of different quality and maturity according to their softening behaviour during shelf-life. Among the various models, those estimated using data at harvest and after 24 h of shelf-life had better performance than those based only on data at harvest. In the 2002 and 2005 seasons, this model showed a classification ability very close to that of models based on data during the whole shelf-life. However, its performance in the 2004 season was not so good, because it could not take into account the influence of cold storage periods prior to shelf-life. All the steps necessary to apply this methodology are detailed.