Evaluation of quality changes and elasticity index of kiwifruit in shelf life by a nondestructive acoustic vibration method

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Abstract

A nondestructive acoustic vibration method combined with kinetic models was used to evaluate the quality changes and elasticity index (*EI*) of kiwifruit in shelf life in this study. The kiwifruit was stored at 0, 4, 10 or 20 °C. On each test day, the elasticity index of the kiwifruit was measured by the nondestructive acoustic vibration method. Then, the samples were measured by the puncture test and sensory evaluation. The results showed that *EI* and the quality indices changed gradually during storage and were significantly affected by the storage temperature. Moreover, *EI* correlated well with the tissue strength and sensory indices. Different kinetic models were used to fit the change in *EI*. The results showed that the first-order kinetic model had a better performance (with R^2 values of 0.986～0.997 and RMSE values of 0.009–0.019 $kHz^2\ kg^{2/3}$) than the zero- and second-order kinetic models. The temperature dependence of the reaction rate (*k*) of *EI* was further modelled by the Arrhenius model. The Arrhenius model showed good performance for modelling *k* as a function of temperature (R^2>0.99). The first-order kinetic model combined with the Arrhenius model was used to evaluate quality changes and *EI* for kiwifruit. The results showed that the errors between the predicted and experimental values of *EI* were within 12%, indicating the established model could be used for the evaluation of quality changes and *EI* of kiwifruit. This study provides a nondestructive method for evaluating the quality changes and *EI* of kiwifruit in shelf life.