

Managing Biological Variation in Skin Background Colour Along the Postharvest Chain of Jonagold Apples

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Abstract

Skin background colour is an important quality aspect in the grading of 'Jonagold' apples, with consumers usually preferring fruit with a green background colour. However, apple handlers are usually faced with large fruit-to-fruit variability of background colour within a population of fruit. In this study, a stochastic modelling approach was used to describe how the initial fruit-to-fruit variability in the background colour of 'Jonagold' apples present at harvest, propagates throughout the postharvest chain. Two hundred and twenty 'Jonagold' apple fruit were harvested and stored at 1 °C or 4 °C, under different controlled atmosphere (CA) conditions for 6 months, followed by 2 weeks exposure to shelf-life conditions, during which the background colour and ethylene production of the individual fruit were measured. A kinetic model was developed to describe the postharvest loss of skin greenness, by assuming that the loss was principally due to chlorophyll breakdown, the rate of which was dependent on the endogenous ethylene concentration. Stochastic model parameters were identified, and by treating these parameters as fruit-specific, the model could account for more than 95% of the variability of the data. By treating the stochastic model parameters as random factors, the Monte Carlo method was used to model and describe the propagation of the fruit-to-fruit variability of the background colour within a population of fruit. The model developed in this study might allow better management of variability in quality along the postharvest chain, by predicting how the initial fruit-to-fruit variability within a batch of apples will propagate throughout the postharvest chain, as a function of storage and shelf-life conditions.

Keywords

Malus × domestica; Kinetic modelling; Monte Carlo; Ethylene production; Fruit quality