

Technical Session Topic: Modified atmosphere storage and packaging

Development of a Mathematical Model of Modified Atmosphere Packaging Systems for Apples

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Abstract

Modified atmosphere packaging (MAP) of horticultural products can provide significant shelf-life extension, but increases cost and there is considerable quality risk if the packaging is poorly designed (e.g. anaerobic conditions if temperature abuse occurs). A unsteady-state mathematical model was developed for MAP of apples in cartons. Key processes included in the model were: the fruit respiration as a function of temperature and fruit O₂ and CO₂ concentrations; heat, O₂, CO₂, N₂ and H₂O exchange between the fruit, package and external atmospheres; changes in MAP film permeability with temperature; condensation of moisture within the package; and moisture sorption by paper-based packaging materials. Gas concentrations and temperature were assumed to be uniform throughout the package. Use of the model as a package design and optimisation tool would substantially reduce the time, cost and risk of developing and testing new MA packaging systems. Validation of the model against experimental data is described in a separate paper.