Title Impact of product and package variability on modified atmosphere packaging

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Abstract

Modified atmosphere packaging (MAP) has been widely used to increase the shelf life of fresh produce by reducing respiration rate, delaying senescence, and inhibiting the growth of spoilage causing organisms. Improperly designed MAP systems may be ineffective or even shorten product shelf life. The most important factors that affect MAP design are respiration rate, storage temperature, film permeability and surface area. A study was conducted to evaluate the impact of variability at 5, 10, 15% of these factors on gas composition inside a package containing whole mango (Var. Nam Dok Mai). A box type package, 17cm (L) x 13cm (W) x 7cm (H), was designed using ethyl cellulose as a packaging film to achieve recommended atmosphere of 6.5% O_2 and 7.4% CO_2. Monte-Carlo technique, a class of computational algorithms that rely on repeated random sampling of factors to compute their results, was applied to simulate the package O_2 and CO_2 considering the variability of four factors. The model indicated that the package O_2 and CO_2 at 5% variability would potentially vary between 4.9 to 8.1 % and 6.0 to 8.7%, respectively which were close to the design O_2 and CO_2 values. Product respiration rate had the most effect on the gas concentration inside the package, followed by storage temperature, film area and its permeability, in decreasing order.