Title Evaluation of edible films and coatings for extending the postharvest shelf life of avocado

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Abstract

The focus of this thesis is to develop pectin-based edible films for application of fruits and vegetables to extend their post harvest shelf life. Preliminary research demonstrated that edible coatings could effectively extend the shelf life of based avocado and peach. The respiration rate, moisture loss, firmness, chemical parameters and color changed in a lower rate in coated fruits as compared with the control. Pectin-based film formulations were then evaluated to identify the proper type and concentration of pectin, lipids and plasticizers in the film. The effects of pectin, beeswax and sorbitol concentration on water vapor permeability, mechanical properties and opacity of the films were then evaluated using response surface methodology to identify appropriate levels of different components. Results of studies on film structure revealed that water vapor permeability increased by pectin and sorbitol concentration and was decreased by beeswax concentration. Mechanical properties were mainly affected by pectin and sorbitol concentration. Beeswax was the most influential factor that affected opacity which increased with increasing beeswax concentration.

In order to successfully employ these films, their adsorption behavior, thermal and thermomechanical properties were evaluated as a function of moisture content and sorbitol concentration. The adsorption behavior was strongly influenced by sorbitol concentration. Moisture content and sorbitol concentration increased the films elongation at break, but decreased tensile strength, modulus of elasticity and Tg, and increased water vapor permeability of the films. Finally, avocado was coated with a pectin-based film and the associated quality changes were evaluated during storage. From storage studies, kinetic parameters (rate constants) and activation energy were quantified to help model the quality changes in avocado quality as function of storage temperature and time. Pectin-based coating resulted in slowing down the rate of quality changes in avocado at each storage temperature. In general, most changes were well described by some form of zero or first order rate. Temperature sensitivity of rate constant was adequately described by the Arrhenius model.

A hyperspectral imaging technique was also used to gather additional tools for following quality changes associated with stored avocados. Artificial neural network (ANN) concepts were evaluated as alternated models for predicting quality changes in coated and non-coated avocados during storage at

different temperature. Modeling of quality changes in avocado indicated that compared to conventional mathematical models, ANN has more feasibility to predict of these changes. Models developed for firmness, weight loss and total color difference had better fitness than respiration rate.

Finally, the effect of coating on disease severity and different properties of avocados infected by *Lasiodiplodia theobromae* was studied. The coated fruits demonstrated slower rate of disease progress, respiration rate, softening and color changes. Respiration rate, firmness and color parameters were sensitive to coating and disease severity, and thus these parameters could successfully used to predict fruit quality from disease in coated and uncoated avocados.