Modeling Microbial Growth in Fresh Asparagus Packed in Modified Atmosphere Packaging and Vacuum Skin Packaging Microwaveable Trays

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ABSTRACT

Foodborne diseases are the illness contracting to human by eating contaminated food and/or beverages. There is an increased interest in ready-to-eat packed fresh products such as in fresh cut produce packed in modified atmosphere packaging (MAP) and Vacuum Skin Packaging (VSP). Unlike other products such as frozen and canned food, the freshness is the key quality of fresh-cut products that are processed by using no heat treatment [1]. Raw fruits and vegetables can be contaminated with the microorganism from harvesting in the field, processing, packing and transportation. Thus, foodborne diseases caused by microbial growth are a critical concern in fresh-cut and ready-to-eat products. Microbial growth in fresh-cut and packed products can lead to spoilage of product. Prediction model of the microbial growth is a tool to estimate shelf life of the product. The usefulness of the model is highly dependent on the accuracy of the estimated parameters. The objective of this study was to estimate the microbial growth parameters in fresh asparagus packed in MAP (Modified Atmospheric Packaging) and VSP (Vacuum Skin Packaging) trays. Pre-trimmed 6-inch fresh asparagus spears were treated with a 200 ppm sodium hypochlorite sanitizer to remove foreign contamination. Cleaned asparagus spears were packed and heat-sealed in microwavable trays with MAP and VSP technique using highly permeable films and stored at 4°C. Samples were analyzed for the microbial growth every three days during the shelf life storage period. Different growth media was used for growth of bacteria, yeast, mold and E.coli, and the samples were incubated at 35 ^{o}C. Non-linear regression was used to model the microbial growth in MAP and VSP packed asparagus. Parameters of the modified Gompertz function were estimated for the growth of microorganisms. For instance, four parameters for the growth of bacteria in asparagus packed in VSP were estimated as 4.5481, 3.0578, 0.2744 and 1.1098. The root mean squared error for the predicted log 10 of number of bacteria vs. time was 0.7896 and 0.7222 in MAP and VSP, respectively. The asymptotic confidence band and prediction band for the predicted numbers of micro-organisms was also plotted. The scaled sensitivity coefficients of all the parameters were computed to compare the relative ease of estimating the parameters in the modified Gompertz model.