THE APPLICATION O[illegible]MATICAL MODEL TO THE DESIGN OF MODIFIED ATMOSPHERE PACKAGING FOR MINIMALLY PROCESSED VEGETABLES

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ABSTRACT

Mathematical models were applied to the design of modified atmosphere packages for minimally processed vegetables, specifically, celery stalks, peeled garlic and onion slices. A review of the modified atmosphere packaging models developed by other researchers showed that many of the models were very similar, but the major problem encountered were the lack of suitable respiration rate data and optimum modified atmosphere composition data.

A modified atmosphere package for the celery stalks was developed using a simple model that relied on literature information for the recommended modified atmosphere gas composition. Respiration rate data were not required for the determination of the best package design. An optimum package design was found, and by the application of this simple model, other bag sizes could be designed that would be able to maintain the desired modified atmosphere.

For the design of the peeled garlic package, respiration rate data was determined in a closed system using an experimental design technique called Response Surface Methodology. The respiration data generated by this experiment was used in a mathematical model to design the required packages. Subsequent storage trials were unsuccessful, raising doubts about the accuracy of the respiration rate data. A modified atmosphere package was designed using the same method used to design the package for the celery stalks.

Response Surface Methodology was unsuccessfully applied to the determination of respiration rates for onions (sliced to various thicknesses) using a closed system. The use of a dynamic model of a package of sliced onions was also unsuccessful in determining the respiration rates. Further work needs to be undertaken to evaluate experimental design techniques for determining the respiration rates of minimally processed vegetables. This data can then be used in mathematical models to determine the optimum modified atmosphere package design.

The importance of processing hygeine is stressed, with high microbial numbers growing within four days on untreated minimally processed produce, but little growth after washing in antimicrobial solutions before packaging.

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