Title Modeling of Respiration Rate of Litchi Fruit under Aerobic Conditions

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Abstract

Respiration of the produce and permeation of gas through the packaging films are the processes involved in creating a modified atmosphere inside a package that will extend shelf life of agricultural perishables. Thus modeling respiration rate of the selected produce is crucial to the design of a successful modified atmosphere packaging system. Two different models based on regression analysis and enzyme kinetics were developed with the help of respiration data generated at temperatures 0, 5, 10, 15, 20, 25, and 30 °C for litchi fruit using the closed system method. Temperature was found to influence the model parameters. In the model, based on enzyme kinetics, the dependence of respiration rate on O_2 and CO_2 was found to follow the uncompetitive inhibition. The enzyme kinetic model parameters, calculated from the respiration rate at different O_2 and CO_2 concentration were used to fit the Arrhenius equation against different storage temperature. The regression coefficients values were used for the prediction of respiration rate using regression model. The activation energy and respiration pre-exponential factor were used to predict the model parameters of enzyme kinetics at any storage temperature. The developed models were tested for its validity at 2 °C. The models showed good agreement with the experimentally estimated respiration rate.

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