Permeable tube channels

USING PERMEABLE TUBE CHANNELS FOR MODIFIED ATMOSPHERE STORAGE OF IRWIN MANGO

By: Rokhani Hasbullah, Sutrisno, Seishi Kawasaki, Takayuki Kojima and Takayoshi Akinaga

Summary

An empirical mathematical model of effective permeability of tube channels and a model based on enzyme kinetics principle for generating respiration rate of Irwin mango (Mangifera Indica Linn.) were studied to create a modified atmosphere (MA) package for maintaining the quality during storage. The results showed that the effective permeability of tube channels of 3 to 9 mm in diameter and 50 to 350 mm in length varied from $7.8 \times 10^{-6}$ to $91.0 \times 10^{-6}$ m$^3$/h for O$_2$ and $7.0 \times 10^{-6}$ to $78.5 \times 10^{-6}$ m$^3$/h for CO$_2$. The multiplicative non-linear model adequately described the effective permeability to tube dimensions with coefficient of determination ($R^2$) of 0.956 and 0.959 for O$_2$ and CO$_2$ permeability, respectively. The enzymatic model of respiration rate generated from 12 different gas compositions fitted the experimental data very well. The model package of a 0.0043 m$^3$ glass jar with 1.2 kg sample (three mangos) using a tube channel of 50 mm in length and 9 mm or 11 mm in diameter attained an equilibrium gas composition of 7.8-10.3 %O$_2$ and 12.0-14.7 %CO$_2$, and showed some improved quality retention within 21 days of storage, while the control fruits were not acceptable after 14 days of storage. The model packages significantly reduced the fruit weight loss and tended to reduce the decline in hardness, SSC and acidity, reduce the incline in pH, and there were no significant changes in visual appearance due to decay incidence. This result suggests that the use of tube channel would be suitable for MA storage of mango.

Keywords: effective permeability, tube channel, respiration rate, modified atmosphere storage, mango.