

Intelligent temperature control of a tropical post-harvest storage system

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Abstract

Control of the complex nonlinear post-harvest storage process is essential to guarantee food security. Intelligent means of control come very handy in handling nonlinear processes. In this research an optimal fuzzy logic controller (FLC) is developed and simulated in MATLAB, with a post harvest storage system model for temperature control of cylindrically shaped foods. Using performance indices such as root mean square error (RMSE) and product mean temperature difference (PMTD), the FLC is optimized through a search process considering two factors, namely, type and number of membership functions (MFs). Several common membership functions (Gaussian, Gbell, Trapezoidal, Triangular and a combined Triangular/Trapezoidal MFs) were tested with varying sizes of 3, 5 and 7 numbers of MFs. The combined type (Triangular MF with trapezoidal shoulders) with RMSE value of 2.4344 and PMTD value of 5.4649 was found to have the best performance.

Keywords: Fuzzy logic control, Mathematical model, Process control, Cooling, Heat transfer, Atmospheric modeling, Postharvest storage, Simulation, Temperature control

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