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Simulation using Computational Fluid Dynamics in the Examination of Ripening Chamber for Process Engineering Investigations

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ABSTRACT

This article focuses on the numerical analysis of a three-dimensional model representing a ripening chamber with dimensions of 3.6 m (length) x 3.0 m (width) x 3.6 m (height). The model is developed to investigate the impact of design parameters on the flow and temperature distributions within the ripening chamber. The objective is to simulate airflow and temperature patterns in the ripening chamber using Computational Fluid Dynamics (CFD) methodology to enhance the continuity of the ripening process through computational insights. The study explores how variations in temperatures, relative humidity (RH) levels, and concentrations of ethephon liquid dip for a duration of 5 minutes affect the flow and temperature distributions within the ripening chamber for mango and papaya fruits. The research constitutes a valid simulation of experimental work, with alterations to the airflow conducted using ANSYS Fluent over an approximate period of 6-8 days for mangoes and papayas. Boundary conditions of the mathematical model were investigated at an airflow rate of 0.5 m/s, considering two scenarios: with and without a load of fruits. The findings indicate that the flow exhibits a uniform temperature gradient at the 4th and 5th flows of the CFD airflow condition for all mango and papaya fruits in the ripening chamber. Additionally, the study demonstrates that CFD serves as a convenient tool for designing and optimizing the flow field in the ripening chamber.

Keywords: Ripening chamber, CFD, ANSYS

How to Cite

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