MATHEMATICAL MODELING AND OPTIMIZATION OF LOW-TEMPERATURE VACUUM DRYING FOR BANANA

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ABSTRACT
Bananas are one of the most common energy yielding fruits, and also a nutritional source for human health. In this study, low-temperature vacuum drying was applied to preserve banana because this method offers a low nutrient loss, a decrease in drying time leading to low energy cost, and the low moisture content preventing products from microbial spoilage. Four mathematical models were built, and a multi-objective optimization problem was established for the drying process. The restricted area method with $R*(Z)$ optimal combination criterion was used to optimize for the drying mode of banana including temperature of 52.76 ℃, pressure of 0.006 mmHg and drying time of 13.94 hours. Experimental results showed that the energy consumption was 3.96 kWh/kg, the residual water content was 3.64 %, the vitamin C loss was 3.27 % and the maximum rehydration capacity was 95.17 %, which convinced that dried bananas had achieved a minimum cost, the best quality, and a long-term storage.