

Modeling, drying kinetics, and antioxidant properties of Bentong ginger based on different drying techniques

Sarmilaah Dewi Subramaniam^a, Nurul Aini Binti Mohd Azman^a, Siti Kholijah Binti Abdul Mudalip^a, Luqman Abdul Halim^b, Firdaus Basrawi^b, Noryanti Binti Muhammad^c

^a Faculty of Chemical and Process Engineering Technology, Universiti Malaysia Pahang, Pahang, Gambang, Malaysia

^b Meliponini Engineering Laboratory, Faculty of Mechanical and Automotive Engineering Technology, Universiti Malaysia Pahang, Pahang, Pekan, Malaysia

^c Centre for Artificial Intelligence & Data Science, Universiti Malaysia Pahang, Pahang, Gambang, Malaysia

ABSTRACT

This study presents the effect of different drying techniques (swirling fluidized bed drying [SFBD], oven drying [OD], and freeze drying [FD]) on the drying kinetics, antioxidant potential, and 6-gingerol concentration of Bentong ginger (BG). Seven mathematical models were applied to the experimental data to determine the best thin-layer drying models for drying applications. Interaction between the drying methods and antioxidant properties has been evaluated using correlation coefficient (R). The Midilli–Kucuk model showed the best fit at explaining the thin layer drying behavior of the BG for OD and SFBD, whereas the Page model showed the best fit for FD. Correlation analysis revealed that the drying methods had a strong positive correlation with DPPH and a moderate negative correlation with 6-gingerol concentration and total phenolic content. The experimental results showed that SFBD reduces the total drying time compared to OD and FD, which translates to a low energy consumption, high drying rate, and moisture diffusivity. In addition, the dried BG sample from the SFBD exhibited a slightly higher DPPH inhibition and total phenolic yield as well as the best option to preserve the 6-gingerol compound in the Liquid Chromatography Quadrupole Time-of-Flight Mass Spectrometry (LC-QTOF/MS) analysis. Thus, the SFBD approach proved to be a feasible method for drying ginger. **Practical applications:** Ginger is considered to be highly perishable foods due to their high moisture content. The most common process for keeping shelf-stable ginger is dehydration. Drying preserves the quality of ginger by lowering the moisture level, which prevents microbial growth and chemical changes during dried storage. The use of fluidized bed (FBD) dryers for agricultural products processing has grown in popularity in recent years. The modified and hybrid FBD systems were observed to be efficient for drying food products in previous studies. The outcome of this research showed that SFBD techniques attain better nutritional quality of ginger through less energy consumption and processing time.

KEYWORDS

6-gingerol; Drying kinetics; Bentong ginger; DPPH antioxidant; Drying techniques

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