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Investigating the impact of blanching and salt treatment on the drying kinetics of oyster mushrooms

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ABSTRACT

This study aims to evaluate the effect of drying temperature and drying kinetics of the blanched and salt-treated oyster mushrooms. The drying temperatures were from 40 to 80 °C. Evaluations were done on the moisture content, rehydration ratio, and physical changes. The CHNS and FTIR analyses were conducted under optimized drying conditions. The drying kinetics were evaluated and the result discovered that the best drying condition with a good rehydration ratio (6.3) and good quality was the salt treatment sample dried at 60 °C in 6 h. The drying kinetic was explored in five different kinetics models, and the parabolic model proved to be the best model with the highest R^2 (1.000), lowest RMSE (7.0899E-05), and MBE (5.02666E-09). The effective moisture diffusivities obtained were $0.4\text{–}1.8 \times 10^{-9}$ m^2/s and the activations energy was 36–45 kJ/mol. The drying and treatment processes significantly impact the intensity of functional groups, carbon, hydrogen, and nitrogen contents. This study provides useful insights into the drying process of oyster mushrooms using oven drying.

1. Introduction

Among the macroscopic fungi, mushrooms are a significant protein source. The oyster mushroom, scientifically known as *Pleurotus ostreatus (P. ostreatus)*, is the most widely grown edible mushroom globally, second only to *Agaricus bisporus* (*A. bisporus*), the white button mushroom (Valverde et al., 2015). It has a high protein content, a significant amount of fibre, essential amino acids, fat content, and a high concentration of essential fatty acids (Valverde et al., 2015). *Pleurotus* species have a variety of therapeutic benefits, including antiplatelet aggregating, antitumor, anti-inflammatory, immunomodulatory, antioxidant, antihypertensive, hypocholesterolaemic, antimicrobial, antiplatelet aggregating, antihyperglycemic, and antiviral activities (Hassan and Medany, 2014).

Fresh mushrooms decay quickly due to their high moisture content (85 %–95 %) (Kumar et al., 2013), thereby they cannot be stored for >24 h at ambient temperature or 2–5 days chilling temperature, depending on the variety (Nour et al., 2011). Throughout the post-harvest period, mushrooms continuously lose weight and their moisture content gradually decreases. As a result, the colour of the mushrooms gradually darkens and influences consumer purchasing decisions (Elbah et al., 2017; Zhang et al., 2018). Consequently, a preservation strategy is required.

Effective preservation techniques have the potential to increase product variety and shelf-life. Dehydration is the most popular method for preserving agricultural products (Maray et al., 2018). Numerous studies have been conducted on mushroom drying techniques such as heat pump drying (Mecha et al., 2023), sublimation process (Mierzejewska et al., 2024), vacuum heat pump drying (Supakarn et al., 2018), infrared-vacuum drying (Salehi et al., 2017), microwave-vacuum (Giri et al., 2014), and drying in a fluidized bed (Wang et al., 2024). The majority of the drying equipment used was high energy consumption and costly, thus posing challenges for small-scale farmers to preserve mushrooms efficiently and economically.

Alternatively, convective drying is a technique that meets industry standards, is easy to install, and is suitable for various drying

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