

البحث السابع

مشترك - منشور بمجلة دولية ((غير مستخلص من رسالة))

عنوان البحث:

Mushroom drying optimization using the Taguchi and Composite desirability methods

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Abstract:

Background: Oyster mushrooms are highly perishable and sensitive to heat, making the optimization of drying processes essential for preserving their nutritional and physical qualities.

Objective: this study aims to optimize the drying kinetics and quality attributes of Oyster mushrooms using a heat pump dryer under varying operating conditions.

Methods: the effects of drying temperatures (40,50,60, and 70°C), air velocity (1,2,3, and 4 m.s⁻¹), slice thickness (1,2,3, and 4cm), and pre-treatment methods (control, blanching, sonication, and chemical) were evaluated. A Taguchi L₁₆ orthogonal design with triplicate runs was employed, followed by multi-objective optimization using principal component analysis integrated with composite desirability function. The responses were drying rate (DR), specific moisture evaporation rate (SMER), moisture diffusion coefficient (D_{eff}), color change(ΔE), rehydration ratio (Rh), total flavonoid content (TFC), and total phenolic content (TPhC).

Results: the highest drying rate (7.086 g/min) was achieved at 70 °C, 4 m·s⁻¹, 1 cm thickness, with sonication. Drying temperature and air velocity contributed 39.2% and 30.3% to the variation in drying rate, respectively. For SMER, temperature and slice thickness had the greatest effects (71% and 14.5%), while effective D_{eff} (1.18 × 10⁻⁸–7.22 × 10⁻⁷ m²/s) was most influenced by slice thickness (67.8%), temperature (14.5%), and pre-treatment (8.9%). Sonication at 60 °C, 2 m·s⁻¹, and 4 cm thickness resulted in the highest Rh (4.67) and ΔE change. The overall optimal drying condition based on composite desirability was 60 °C, 4 m·s⁻¹, 4 cm thickness, with sonication pre-treatment.

Conclusion: this study demonstrates that process optimization significantly enhances drying efficiency and product quality, with sonication emerging as the most effective pre-treatment method.

الباحثون:

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