

Equilibrium Moisture Content and Thin Layer Drying Model of Shiitake Mushrooms Using a Vacuum Heat-pump Dryer

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ABSTRACT

The objective of this research was to experimentally determine the equilibrium moisture content of Shiitake mushrooms under vacuum conditions by using a vacuum heat-pump dryer. The mushrooms were dried at a pressure of 0.2 bar and temperatures of 50, 55, and 60°C. A saturated salt solution was used to control the relative humidity within 10-75%. This study found that vacuum drying tended to increase the equilibrium moisture content of the mushrooms and the relative humidity as the drying temperature decreased. Of the correlations proposed by Oswin, Guggenheim-Anderson-de Boer (GAB), Peleg, modified Oswin, and modified GAB, the functional form of Peleg was the best fit (R^2 of 0.99). The moisture content of the mushrooms, as measured during drying, were used with the equilibrium moisture content values obtained from the proposed equations to determine the moisture ratios of the mushrooms at different drying times. Among nine well-known correlations, the functional form of the thin layer model proposed by Midilli best predicted the drying of Shiitake mushrooms under vacuum.

Keywords: Equilibrium moisture content, Shiitake mushroom drying, Vacuum drying, Thin layer drying model

INTRODUCTION

Shiitake is a popular mushroom with a nice smell, good taste, and high nutritional value; it also provides substances to reduce cholesterol. With regular consumption, it may prevent cancer and some viral infections, like the cold (Shukla and Singh, 2007). Fresh and dried mushrooms are edible, and mushrooms are often dried to reduce lose during transportation and preserve them. Sun drying costs little and is popular in tropical areas. However, sun drying takes a long time and it is difficult to control the climate and humidity, so alternatives such as hot-air, microwave-vacuum, fluidized-bed, and heat-pump driers have been developed. Previous studies have analyzed some of these techniques with different mushrooms – for example, hot air drying of oyster mushrooms at different air temperatures (50, 55, 60, and