

Mathematical modelling of osmo-convective dehydration of button mushroom (*Agaricus bisporus*) slices

■ BIRENDRA KUMAR MEHTA, SANJAY KUMAR JAIN AND ASHOK KUMAR

SUMMARY : The drying characteristics of mushroom slices were investigated in an experimental axial flow dryer and modelled at various air temperatures of 45, 55, 65, 75 and 85°C and velocity of air such as 1.0, 1.5 and 2.0 m/s. The entire drying process took place in the falling rate period. The average effective moisture diffusivity ($D_{eff, avg}$) values of osmo-convectively dried mushroom samples varied considerably with moisture content and air drying temperature from 1.392×10^{-9} to 4.671×10^{-9} , 1.435×10^{-9} to 4.814×10^{-9} and 1.570×10^{-9} to 4.919×10^{-9} m²/s for air velocity of 1.0, 1.5 and 2.0 m/s, respectively. The six thin-layer drying models Exponential, Henderson and Pabis, Page, Modified page, Logarithmic and Power law models were applied and validated on the basis of determination of coefficient (R^2), reduced mean square (χ^2) of the deviation, and root mean square error (E_{RMS}) between the observed and predicted values of moisture ratios. Page model was found to be the most satisfactory than the other models.

Key Words : Mushroom, Osmo-convective, Diffusivity, Moisture ratio, Modelling

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Today, mushroom cultivation is one of the biggest money spinning enterprises in the world and mushroom is an important horticultural cash crop. Its production has tremendous scope as an income generating activity. Mushroom being an indoor crop does not require arable land, except for some non-agricultural land to build infrastructure for preparation of substrate, raising of crop, preparation of spawn and post harvest handling, hence, it is of great importance for landless and marginal farmers. But post-harvest problems of mushroom arise due to its high moisture content (*i.e.* about 90

per cent) and respiration at a very fast rate. This accelerates deteriorative changes, with the result product becomes high perishable with the shelf life of 1-2 days only under ambient temperature and humidity (Lal Kaushal and Sharma, 1995). Loss of texture, development of off flavour and discolouration results in poor marketable quality and restricts trade of fresh mushrooms. Besides they grow in flushes and every 8-10 days, they are harvested in batches. In between the flushes, the production comes down quite low. The demand, therefore, never coincides with supply. In the peak period of harvesting due to the gluts in the market, owing to highly perishable nature, ensuring income security to farmers and bring nutritional security, its preservation in the form of more stable products is of great importance.

For these reasons, several dehydration methods or combinations of methods can be used including osmo-convective drying, microwave drying, solar drying, hot-air, freeze drying, osmotic dehydration, spray drying, impregnation vacuum, etc. Among these, application of osmo-convective drying for vegetables improves the quality of final product (dried vegetables). Hence, osmotic dehydration is used as a

MEMBERS OF THE RESEARCH FORUM

Author for Correspondence :

BIRENDRA KUMAR MEHTA, Department of Processing and Food Engineering, College of Technology and Agricultural Engineering, Maharana Pratap University of Agriculture and Technology, UDAIPUR (RAJASTHAN) INDIA

Email : bkmehtacae@gmail.com

Coopted Authors:

SANJAY KUMAR JAIN AND ASHOK KUMAR, Department of Processing and Food Engineering, College of Technology and Agricultural Engineering, Maharana Pratap University of Agriculture and Technology, UDAIPUR (RAJASTHAN) INDIA