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Thin layer drying kinetics of Sri Lankan paddy varieties under low humid conditions

R P N Randunu, H H E Jayaweera, T R Ariyaratne*
Centre for Instrument Development, Department of Physics, University of Colombo, Colombo 00300, Sri Lanka

Rapid biological degradation of food under high humid conditions is a well known effect. The conditions of stored grains are determined by complex interactions between the grain and the macro and micro-environment, and a variety of organisms including micro-organisms, insects, mites etc. and their existence has direct link to the moisture content in grain. The objective of this study is to investigate the effects of environmental humidity on the drying of paddy. In addition to the characterization of locally produced paddy, important applications of the findings can be found in the design and construction of modern warehouses for storage of paddy.

Thin layer drying characteristics of paddy were examined within the relative humidity (RH) range from 30% to 60%. BG358 and BG359 pure line paddy collected from Rice Research and Development Institute, Bathalagoda, Ibbagamuwa, and a constructed prototype low humid chamber have been used for this study. The data of sample weight of paddy, ambient air temperature and RH of the drying air were recorded continuously during each test. Normalized drying data was transformed into dimensionless parameter called Moisture Ratio (MR), and fitted with different semi-theoretical models. The two-term model gave better predictions than the other models, and satisfactorily described the thin-layer drying characteristics of paddy. Diffusion coefficient of BG358 is found to vary from 0.0040 1/S to 0.0056 1/S, and BG359 from 0.0045 1/S to 0.0057 1/S. The effective diffusivity of BG358 varies from 3.68×10^{-10} m^2/S to 5.11×10^{-10} m^2/S and the effective diffusivity of BG359 varies from 4.64×10^{-10} m^2/S to 5.85×10^{-10} m^2/S over the RH range. RH dependence of the diffusivity coefficient can be described using the Arrhenius-type relationship.

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*ari@phys.cmb.ac.lk Tel: 011-2584777