

Cubic spline as a powerful tool for processing experimental drying rate data of seaweed using solar drier

ABSTRACT

A solar drying experiment of seaweed, *Kappaphycus alvarezii* var. *tambalang* using v-groove hybrid solar drier (v-GHSD) was conducted in Semporna, Sabah, under the meteorological condition of Malaysia. Drying of the seaweed in the v-GHSD led to a reduction in its moisture content from 85.32% to 38% in 5 days with mean solar radiation of 650 W m^{-2} and mass flow rate of approximately 0.27 kg s^{-1} . Generally, the plots of the drying rate required more smoothing compared to the moisture content data; special care was needed at low drying rates and moisture contents. Here, we show that the cubic spline (CS) can be effective for estimating the drying rate-time curves. The idea of this method consists of an approximation of data by a CS regression having first and second derivatives. The analytical differentiation of the spline regression permitted the determination of instantaneous rate. The method of minimizing the function of average risk was used successfully to solve the problem. This method allowed us to obtain the instantaneous rate directly from the experimental data. Mathematical models using the raw data tested with the smoothed CS were found to be reliable estimators of the moisture-time curves as well as for the missing moisture content data of the seaweed.