UMS | eNewsletter

UNIVERSITI MALAYSIA SABAH

INTRODUCTION

University Malaysia Sabah intends to increase the visibility of universities in global rankings. Through this eNewsletter, university's achievements, products and international activities at UMS distributed to all institutions, especially outside of Malaysia. Email of notification was sent to the institution on March 21, 2016. We also requested a suggestions regarding when and how this eNewsletter to be sent to the institution according to your needs.

OBJECTIVE

The main objective of this eNewsletter is to create an alternative medium for displaying information about UMS.

- eNewsletter is a monthly publication throughout the year.
- eNewsletter contains three (3) segments,
    - the achievement of the university,
    - product of the university; and
    - university international seminar / conferences.

ABOUT UMS

UMS Corporate Video. More video at UMS2U.

ACHIEVEMENT

Sabah's staghorn corals comparable to neighbours

UMS ADMISSION

UNDERGRADUATE

POSTGRADUATE

KOTA KINABALU: The most comprehensive checklist of the largest reef-building corals in Sabah, the staghorn corals (Acropora spp.), was recently published by a team of researchers from Universiti Malaysia Sabah (UMS) in the November issue of the international journal Zootaxa (Magnolia Press).

The researchers reported 83 species of staghorn corals occuring in the waters of Sabah through review of published accounts within the last three decades by various research groups, and records of voucher specimens deposited in the Biotechnology Research Institute (BRI) and Borneo Marine Research Institute (BMRI) of UMS, and the Museum of Tropical Queensland, Australia. Read More...

PUBLICATION

INDEXED BY SCOPUS

PRODUCT

RESEARCH HIGHLIGHTS

(Continue from previous page)

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GRANT CODE
PR00088

GRANT PERIOD
2 Years
(August 1, 2013-July 31, 2015)

1 Figure 1: Inclined Bed Dryer (IBD) in KilangPadi Seri DusunSdn. Bhd., Kota Belud, Sabah

2 Figure 2: 40 kg capacity of LAMB dryer

3 Figure 3: Schematic Diagram of LAMB dryer system

Drying Of Paddy in Laterally Aerated Moving Bed (LAMB) Dryer

Laterally Aerated Moving Bed (LAMB) dryer is a novel design of convective drying unit. Drying is perhaps the oldest, most common and most diverse of chemical engineering unit operations which is an essential process in the chemical, agricultural, biotechnology, food, polymer, ceramics, pharmaceutical, pulp and paper, mineral processing, and wood processing industries. The advantages of LAMB are uniformity of air distribution, low pressure drop, and high mass and heat transfer, suggesting that it has a great potential to be used in biomass drying, such as paddy. In this research, paddy also known as rough rice, was used as drying material for LAMB dryer. Freshly harvested paddy generally contains moisture content in range of 20 to 27% while wet and is dried until reaches an optimum 11-14% of moisture, for the purpose of long period storage and milling process. Two LAMB dryers were designed and fabricated, a 10 kg capacity, single-tubed LAMB dryer and a 40 kg capacity multi-tubed LAMB dryer, along with a complete drying system. The two LAMB dryer design has been patented by IPVOLUSI.

In the early stage of the project, some preliminary studies were performed for a better understanding of industrial dryer and agricultural biomass' characteristics. The first preliminary case study was conducted on an industrial scale inclined bed dryer (IBD) (Figure 1) on its performance in a local rice mill in Kota Belud, Sabah. The study analyzed the moisture content and temperature of the paddy at certain intervals during the operation of the IBD. The quality of the rice was measured using the mill rice grader based on the percentage of broken rice. The results showed that the dryness of the paddy was not uniform as indicated by the ANOVA test. The poor drying uniformity could be associated with poor aeration as a result of clogging of the air filter in the bed. In addition, unsystematic tempering period was also suspected to contribute to poor dryness uniformity of the paddy. Overall, the lack of dryness uniformity can be associated with the limitation of the IBD itself. As a consequence, the percentage of broken rice is high (~ 11%), which lowers the grade of the rice.

The second preliminary study was on the effect of temperature on the drying rate of paddy. The objective of this study was to determine the effect of temperature on drying rate of fragrant paddy via conduction heating, and subsequently, to propose a mathematical model that represents its effect on the drying rate. The study was done by heating 25g of paddy at different temperatures (40, 50, 60, 70 and 80 °C) in an oven. The mass of the paddy was measured at certain time intervals until the paddy was completely dried, whereas, the mathematical model was obtained via curve fitting technique. Three

mathematical models were fitted into all the data. The results showed that different levels of heating exhibited different drying rates. Drying time was reduced as the temperature increased. The highest drying rate provided 23.17% of weight loss and took 35 hours, at 80°C. Moreover, the best mathematical model that represented the effect of temperature on the drying rate was y = a*exp(-b*x) + c*exp(-d*x) equation (y = net weight; x = time; a, b, c & d = constant in terms of temperature) with the R2=0.9988 for curve fitness, which is similar to two term drying model in the literature.

The third and final preliminary study was on the effect of temperature on drying rate of different varieties and maturity of paddy in an oven. The objective of this study was to determine the effect of oven temperature on the drying rate of paddy of different varieties and maturity and to devise a mathematical model to represent its effect on the drying rate. The study was performed by heating 25g of paddy at different temperatures (40, 50, 60, 70 and 80 °C) in an oven. The mass of the paddy was measured at certain time intervals until completely dried. Five different mathematical models were fitted into the data. The results showed that different levels of heating produced different drying rates. Drying time shortened as temperature increased. The highest drying rate provided 23.17% of weight loss and took 35 hours at 80°C. The exponential decay (double, four parameters) model (two-term model) is suitable for drying Sarawak paddy and unripe local paddy; on the other hand, ripe local paddy drying characteristic's data fits to exponential decay (single, three parameters) model.

Next, this novel study focused on the design and fabrication of a unit of pilot scale multi-tubes LAMB with 40 kg capacity (Figure 2 and 3). Furthermore, the performance of LAMB dryer was evaluated by conducting a forced aerated ambient temperature paddy drying. The results showed that LAMB system improved the uniformity in air distribution compared to the IBD paddy dryer used in a local rice mill.

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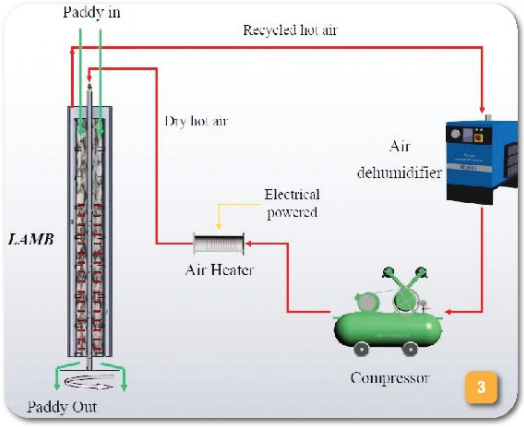

3

Model Name	Model
1. Exponential rise to max (single, 3 parameters)	$y = y_0 + a(1 - e^{-bx})$
2. Hyperbola (single rectangular I, 3 parameters)	$y = y_0 + \frac{ax}{b + x}$
3. Hyperbola (hyperbolic decay, 3 parameters)	$y = y_0 + \frac{ab}{b + x}$
4. Exponential decay (single, 3 parameters)	$y = y_0 + ae^{-bx}$
5. Exponential decay (double, 4 parameters)	$y = ae^{-bx} + ce^{-dx}$

4 Table 1: Mathematical model applied to drying curves of paddy

Malaysia Technical Scientist Association

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