

MODELLING THE THIN LAYER DRYING KINETICS OF COCOA BEANS IN A PASSIVE SOLAR DRYER AND UNDER OPEN SUN

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Abstract

Drying experiments were conducted on cocoa beans using a mixed mode passive solar dryer and open sun drying methods. The drying data obtained from the experiments were fitted into ten different published thin layer drying models. The performance of these models was examined by comparing the coefficient of correlation (R^2), reduced Chi-square (χ^2) and root mean square error (RMSE) between the experimental and predicted values of moisture ratios. Among these models, the Midili-Kucuk model showed good agreement with the data obtained from the experiments for both the solar drying and the open-air sun drying method under the conditions tested.

KEYWORDS: Cocoa beans, Modelling, Solar drying, Sun drying, Moisture ratios.

1. INTRODUCTION

Cocoa beans the world over has remained relevant for a variety of uses and Nigeria has her own fair share in contributing to the world market. Since the introduction of the crop (cocoa) into Nigeria in about 1874 (Oyedele, 2007), fourteen (14) of Nigeria's 36 states grow cocoa: Abia, Adamawa, Akwa-Ibom, Cross-River, Delta, Edo, Ekiti, Kogi, Kwara, Ogun, Ondo, Osun, Oyo, and Taraba (Otedo News Update, 2014; Corporate Nigeria, n.d.). Out of these states, the South Western States of

Nigeria, which include: Ondo, Oyo, Osun, and Ekiti are regarded as the "cocoa belt" of Nigeria, out of which Ondo is regarded as the highest producing state (Ajayi *et al.*, 2012). The cocoa beans produced in Nigeria, Africa, as well as other countries of the world are basically for its chocolate which has alternative uses, and applications.

Cocoa beans is mainly consumed as chocolates and widely used in beverages, cosmetics, pharmaceuticals and toiletry products (Oke and Omotayo, 2012;