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Moisture-Sorption Study of Locally-Parboiled Rice

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Abstract

Moisture sorption characteristics of IR-8 rice variety were investigated at 34^oC using the static gravimetric procedure and at 0.10 – 0.98 water activity. Both the adsorption and desorption modes for the grains followed the BET (Brunauer-Emmet-Teller) Type II model. Five moisture sorption models, namely Bradley, Smith, Henderson, BET and GAB (Guggerhein-Anderson-de Boer) were tested for their predictive capability on these grains data. The coefficients of determination varied from 0.8876 – 0.9986 with percent standard errors of estimates between 0 – 52. Both the Henderson and Bradley models gave the closest moisture contents to the experimental data under the adsorptive and desorptive modes. The appropriate constants in the sorption equations were calculated at 34^oC. The monolayer moisture contents were calculated using both the GAB and BET models and these are quite useful in assessing the storage stability of the rice grains.

Keywords: *Moisture, sorption, rice, water activity, models, storage stability, monolayer.*

Introduction

In Nigeria, there exists a large volume of agricultural produce at the farm gate and yet a delicate balance exists between food supply and the population depending on it for survival. This unwarranted situation is experienced because a substantial part of the farm produce which includes grains gets spoilt after harvest. This is partly as a result of inadequate storage, packaging and preservation techniques. The post-harvest stability of cereal grains is of paramount importance as grains form a substantial part of energy sources for Nigerians. It therefore becomes pertinent for food engineers to be able to develop effective storage, packaging, preservation and processing strategies to increase the food supply. Rice constitutes a group of important staple foods eaten in different forms in Nigeria.

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The post-harvest stability of the grains depends on their moisture contents at harvest; conditions prevailing in their immediate environment during transportation, pre-processing and storage; and also on their moisture-sorption behaviours. Water, as the most important storage factor, plays a significant role in storage stability of agricultural produce depending on the chemical composition and physical structure of the produce and on the form in which it exists in the produce (Ajisegiri and Chukwu 2004; Chukwu and Ajisegiri 2005).

The moisture sorption characteristic of an agricultural material describes its equilibrium moisture content at any relative humidity and the ability for moisture exchange between the agricultural material and its environment (Chukwu and Ajisegiri 2006). When grains, including rice, absorb water they undergo changes in their constitution, dimension, phase transformation, and storage and processing requirements. These changes become relevant in storage studies since environmental factors