



Equilibrium moisture content and heat of sorption of *Gelidium sesquipedale*

L. Ait Mohamed^{a,b}, M. Kouhila^{a,*}, S. Lahsasni^{a,b}, A. Jamali^a, A. Iddimam^a,
M. Rhazi^a, M. Aghfir^a, M. Mahrouz^b

^a *Laboratoire d'Energie Solaire et Plantes Aromatiques et Médicinales, Ecole Normale Supérieure, BP 2400, Marrakech, Morocco*

^b *Unité de Chimie Agroalimentaire (LCOA), Faculté des Sciences Semlalia, BP 2390, Marrakech, Morocco*

Accepted 12 March 2004

Abstract

Moisture equilibrium data for adsorption and desorption of water from *Gelidium sesquipedale* were investigated at temperatures in the range of 30–50°C and water activity ranging from 0.05 to 0.9. The experimental procedure used was based on the gravimetric static method. The sorption curves of *Gelidium sesquipedale* decreased with increase in temperature at constant relative humidity. The hysteresis effect was observed. The experimental data of sorption were described by six models. The GAB and modified BET models were found to be the most suitable for describing the sorption curves. The isosteric heats of desorption and adsorption of water were determined from the equilibrium data at different temperatures. © 2004 Elsevier Ltd. All rights reserved.

Keywords: Equilibrium moisture content (EMC); *Gelidium sesquipedale*; Isosteric heat of sorption; Modelling; Sorption isotherms

1. Introduction

The production of agar from red algae has become an important sector of industry in Morocco. This industry provides the country with an annual export income of approximately 40 million euros. In total, around 500 workers are employed in this sector. It is primarily the *Gelidium* species of algae which are used, with *Gigartina* and *Gracilaria* species being used to a lesser extent. These

*Corresponding author. Tel.: +212-44-34-07-89; fax: +212-44-34-22-87.

E-mail address: kouhila@hotmail.com (M. Kouhila).

Nomenclature

A , B , and C	model coefficients
ads	adsorption
a_w	water activity
B_0 , C_0 , h_1 , and h_2	GAB coefficients
d.b.	dry basis
des	Desorption
d_f	number of degrees of freedom
EMC	equilibrium moisture content
e.r.h.	equilibrium relative humidity
M	equilibrium moisture content (% d.b.)
$M_{i,exp}$	i th experimental moisture content (% d.b.)
$M_{i,pre}$	i th predicted moisture content (% d.b.)
M_m	monolayer moisture content (% d.b.)
MRE	mean relative error (%)
N	number of data points
Q_{st}	net isosteric heat of sorption (kJ/mol)
r	correlation coefficient
R	universal gas constant (8.314 J/mol K)
SEM	standard error of moisture
t	temperature ($^{\circ}$ C)
T	absolute temperature (K)

algae are harvested from natural stocks along the entire Moroccan Atlantic coast and for some years there has been a dramatic decrease in natural algae stocks which can be traced back to over cropping and incorrect cultivation methods.

Algae species of economic interest such as *Gelidium sesquipedale* (Clem.) Thuret et Bornet occur here naturally, which means that it should not be necessary to import ecologically dubious foreign varieties (Gayral, 1958). Agar-agar is widely used as a treatment for constipation, its therapeutic value depends on the ability of the dry agar to absorb and retain moisture (Iglesias and Bueno, 1999). Its action is mechanical and analogous to that of the cellulose of vegetable foods, aiding the regularity of bowel movements. It is sometimes used as a gelling agent for jams and jellies (Thakur and Kumar, 1999). Agar-gelidium has been referred to as the “queen” of gelling agents (Vignon et al., 1994)

The storage conditions of *G. sesquipedale* have a substantial influence on its viability and longevity. It is necessary to investigate the equilibrium moisture content relationships of *G. sesquipedale* at various relative humidities (r.h.) and temperatures to enable the storage conditions for *G. sesquipedale* to be correctly specified. The automatic control of these conditions requires a reliable mathematical description of the equilibrium moisture content (EMC) and equilibrium relative humidity (e.r.h.) using suitable models. Knowledge of the heat of sorption is important in understanding the mechanism of sorption. It is a valuable tool in designing the

Download English Version:

<https://daneshyari.com/en/article/9474876>

Download Persian Version:

<https://daneshyari.com/article/9474876>

[Daneshyari.com](https://daneshyari.com)