

*

(/ / : - / / :)

(EMC)

(χ) (R^2) (GAB) (RMSE)
/ / / / / / / / / /
(BET)
/ () /

:

(FAO.org)

)

(Cruciferea)

(

(Brassica)

()

()

(www. FAO.org)

()

www.)

www.)

(FAO.org)

(FAO.org)

:

www.)

Ink (Mohsenin, 1996) Brooker et al., ()
bottle (1992)

(Zomorodian & Tavakoli, 2004)

() (ERH)

()
()

(Brooker et al., 1992)
(2007) Zomorodian & Tavakoli

()

S
)

Brooker et al., ()
(1992)

(2005) Aviaraa et al.

()

(Zomorodian & Tavakoli, 2007)

S

8. Shrinkage
9. Adsorption
10. Sorghum malt
11. Span

1. Moisture sorption-desorption isotherms
2. Equilibrium relative humidity
3. Isotherm curves
4. S-shaped or sigmoid-type
5. Hygroscopic materials
6. Hysteresis
7. Desorption

(E_s)

(2008) Oyelade et al.

(2002) Lahsasni et al.

S

(2008) Oyelade et al.

() /
() /
() /

(2008) Lee & Lee S

(Inonotus obliquus mushroom)

()

(1999) Correa et al.

Hyola 401

()

)

(

()

/

(Zomorodian, 2001; Zomorodian & Taakoli, 2004)

()

(())

()

() (RH) ()

()

× ()

Zomorodian & Tavakoli,)

(()) (2004

(() ())

1. ATBIN sinus

()

()	()
KOH	%
LiCl	
KC2H3O2	%
MgCl2	%
MgNO3	%
NaNO2	%
NaCl	
KNO3	%

(T °C)

A&D

GF 300

/

)

(

)

()

(

2. Analog to Digital Conversion

... :
)
)
 .(()
)
 /
 Ghodake et) ()
 al., 2006; Jamali et al., 2005; Lee & Lee, 2008; Sinija &
 .(Mishra, 2007; Toghrul & Arsalan, 2006

$Me = \exp(\ln(A) - B \times RH)$	(Lee & Lee, 2008)
$Me = A + B \ln(-\ln(RH))$	(Lee & Lee, 2008)
$Me = \frac{ABC(RH)}{(1-C(RH))(1-C(RH)+BC(RH))}$	(Ghodake et al., 2006; Sinija & Mishra, 2007)
$Me = \left(-\frac{A}{\ln(RH)}\right)^{\frac{1}{B}}$	(Lee & Lee, 2008)
$Me = \left(-\frac{\ln(1-RH)}{A}\right)^{\frac{1}{B}}$	Toghrul & Arsalan, 2006; Lee & Lee,) (2008)
$Me = \frac{A}{\ln(RH)} + B$	(Lee & Lee, 2008)
$Me = \frac{(A+BT)(C)(RH)}{(1-RH)(1-RH+C \times RH)}$	(Jamali et al., 2005)
$Me = -\ln\left[-\frac{(T-C)(\ln(RH))}{A}\right]\left(\frac{100}{B}\right)$	(Ghodake et al., 2006)
$Me = \left[-\frac{\exp(A+BT)}{\ln(RH)}\right]^{\frac{1}{C}}$	Ghodake et al., 2006; Sinija &) (Mishra, 2007)
$Me = \left[-\frac{\ln(1-RH)}{A(T+C)}\right]^{\frac{1}{B}}$	Ghodake et al., 2006; Sinija &) (Mishra, 2007)
$Me = (A+BT)\left(\frac{RH}{1-RH}\right)^C$	(Ghodake et al., 2006)
$Me = (A+BT) - (C+DT)\ln(1-RH)$	(Ghodake et al., 2006)
$Me = A\left(\frac{RH}{1-RH}\right)^B$	Sinija & Mishra, 2007; Toghrul & Arsalan,) (2006)

(RMSE)

(R²)

(χ)

()

Oyelade et al.,)

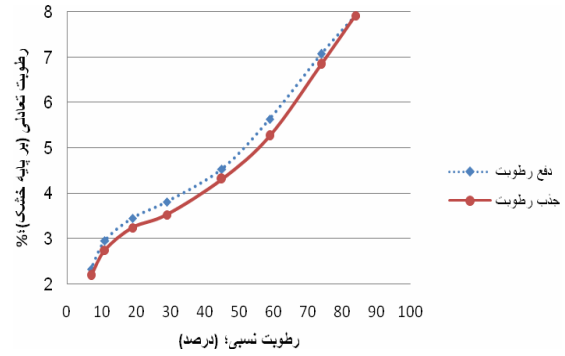
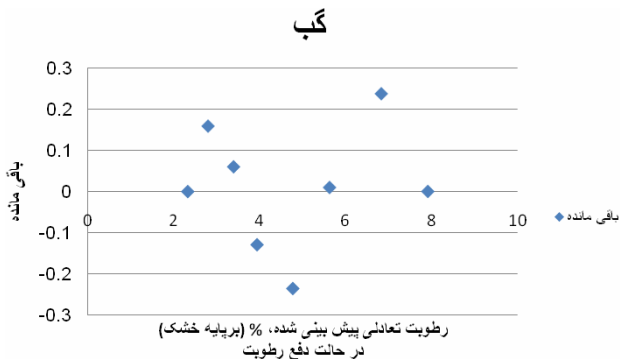
2008 (a); Oyelade et al., 2008 (b); Ghodake et al., 2006; (Mohsenin, 1996

() ()

()

(GAB)

()



Solver

(χ)

¹(R²)

(RMSE)

(Midilli et al., 2002)

$$R^2 = \frac{\left(\sum_{i=1}^N (MR_{exp,i} - \overline{MR}_{exp}) (MR_{pre,i} - \overline{MR}_{pre}) \right)^2}{\sum_{i=1}^N (MR_{exp,i} - \overline{MR}_{exp})^2 \sum_{i=1}^N (MR_{pre,i} - \overline{MR}_{pre})^2} \quad ()$$

$$\chi^2 = \frac{\sum_{i=1}^N (MR_{exp,i} - MR_{pre,i})^2}{N - n} \quad ()$$

$$RMSE = \left[\frac{1}{N} \sum_{i=1}^N (MR_{exp,i} - MR_{pre,i})^2 \right]^{\frac{1}{2}} \quad ()$$

:

:MR_{exp}

:MR_{pre}

:N

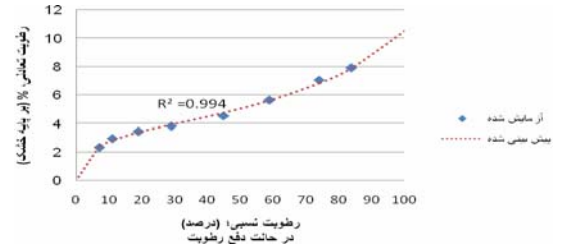
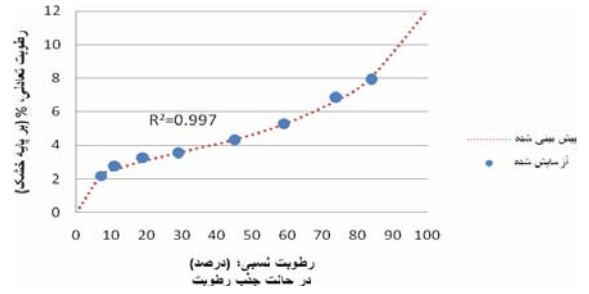
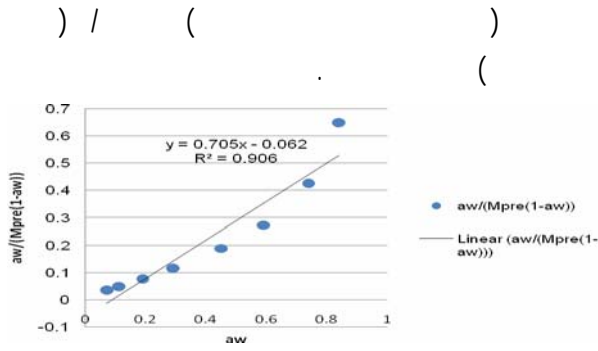
(

:n

Oyelade et al., 2008 (a);)

(Oyelade et al., 2008 (b); Sobukola & Dairo, 2007

()



- () : A, B, C, D
- : a_w
- : c
- () : ERH
- () : m
- : M_e
- : MR
- () : m_0
- : n
- : N
- : R^2
- () : RH
- : RMSE
- () : T
- : χ

$$a_w = \frac{a_w}{m(1-a_w)} \quad (a_w) \quad m)$$

(Zomorodian, 2001)

$$(c-1) / m_0 c$$

(()) $1/m_0 c$

/

/ c

() / m_0

(2002) Lahsasni et al. (Lahsasni et al., 2002)

() /

(2008) Lee & Lee .

RMSE	χ^2	R^2	D	C	B	A
/	/	/	/	/
/	/	/	/	/
/	/	/	...	/	/	/
/	/	/	/	/
/	/	/	/	/
/	/	/	/	/
/	/	/	...	/	/	/
/	/	/	...	/	/	/
/	/	/	...	/	/	/
/	/	/	/	/	/	/
/	/	/	/	/

RMSE	χ^2	R ²	D	C	B	A
/	/	/	/	/
/	/	/	/	/
/	/	/	...	/	/	/
/	/	/	/	/
/	/	/	/	/
/	/	/	/	/
/	/	/	...	/	/	/
/	/	/	...	/	/	/
/	/	/	...	/	/	/
/	/	/	...	/	/	/
/	/	/	...	/	/	/
/	/	/	...	/	/	/
/	/	/	/	/
/	/	/	...	/	/	/
/	/	/	...	/	/	/
/	/	/	/	/

REFERENCES

- Aviaraa, N. A., Ajibolab, O. O., Aregbesolab, O. A. & Adedeji, M. A. (2005). Moisture sorption isotherms of sorghum malt at 40 and 50 °C. *Journal of Stored Products Research*, 42, 290–301.
- Brooker, D., Bakker-Arkema, F. W. & Hall, C.W. (1992). *Drying and storage grains and oilseeds*. AVI Book by Van Nostrand Reinhold, New York.
- Correa, P. C., Martins, J. H. & Christ, D. (1999). Thin layer drying rate and loss of viability modelling for rapeseed (Canola). *Journal of Agricultural Engineering Research*, 74, 33-39.
- Ghodake, H. M., Goswami, T. K. & Chakraverty, A. (2006). Moisture sorption isotherms, heat of sorption and vaporization of withered leaves, black and green tea. *Journal of Food Engineering*, 78, 827-835.
- Jamali, A., Kouhila, M., Ait Mohamed, L., Idlimam, A. & Lamharrar, A. (2005). Moisture adsorption-desorption isotherms of Citrus reticulata leaves at three temperatures. *Journal of Food Engineering*, 77, 71-78.
- Lahsani, S., Kouhila, M., Mahrouz, M. & Kechaou, N. (2002). Experimental study and modeling of adsorption and desorption isotherms of prickly pear peel (*Opuntia ficus indica*). *Journal of Food Engineering*, 55, 201-207.
- Lee, J. H. & Lee, M. J. (2008). Effect of drying method on the moisture sorption isotherms for *Inonotus obliquus* mushroom. *LWT*, 41, 1478-1484.
- Midilli, A., Kucuk, H. & Yapar, Z. A. (2002). New model for single-layer drying. *Drying Technology*, 20(7), 1503-1513.
- Mohsenin, Nuri N. (1996). *Physical properties of plant and animal materials*. Gordon and Breach publishers.
- Oyelade, O. J., Tunde-Akintunde, T. Y. & Igbeka, J. C. (2008). Predictive equilibrium moisture content equations for Yam (*Dioscorea rotundata*, Poir) flour and hysteresis phenomena under practical storage conditions. *Journal of Food Engineering*, 87(2), 229-235.
- Oyelade, O. J., Tunde-Akintunde, T. Y., Igbeka, J. C., Oke, M. O. & Raji, O. Y. (2008). Modeling moisture sorption isotherms for maize flour. *Journal of Stored Products Research*, 44(2), 179-185.
- Pixton, S. W. & Howe, R. W. (1983). The suitability of various linear transformations to represent the sigmoid relationship of humidity and moisture content. *Journal of Stored Products Research*, 19, 1-18.
- Sinjia, V. R. & Mishra, H. N. (2007). Moisture sorption isotherms and heat of sorption of instant (soluble) green tea powder and green tea granules. *Journal of Food Engineering*, 86, 494-500.
- Sobukola, O. P. & Dairo, O. U. (2007). Modeling drying kinetics of fever leaves (*Ocimum viride*) in a convective hot air dryer. *Nigerian Food Journal*, 25(1), 146-154.
- Toghrol, H. & Arsalan, N. (2006). Moisture sorption behavior and thermodynamic characteristics of Rice stored in a chamber under controlled humidity. *Journal of Biosystems Engineering*, 95(2), 181-195.
- www.FAO.org.
- Zomorodian, A. A. (2001). Evaluating thin layer characteristics for Iranian rough rice varieties to determine the equilibrium moisture content. *Journal of Agricultural Engineering Research*, 2 (7), 27-40.
- Zomorodian, A. A. & Tavakoli, R. A. (2004). Determining Equilibrium Moisture Content isotherms for Pistachio and proposing appropriate mathematical models for predicting the EMC in three Iranian pistachio cultivars. *Iranian Journal of Agricultural Sciences*, 35(2), 379-392. (In Farsi)
- Zomorodian, A. A. & Tavakoli, R. A. (2007). The Adsorption-Desorption Hysteresis Effect on Pistachio Nuts. *Journal of Agricultural Science and Technology*, 9(4), 259-265.

() , ()