Accepted Manuscript

Vacuum drying of rosehip leathers: Modelling of coupled moisture content and temperature curves as a function of time with simultaneous time-varying ascorbic acid retention

Silvana M. Demarchi, R. Martín Torrez Irigoyen, Sergio A. Giner

PII:	S0260-8774(18)30138-9
DOI:	10.1016/j.jfoodeng.2018.03.027
Reference:	JFOE 9211
To appear in:	*Journal of Food Engineering*
Received Date:	11 October 2017
Revised Date:	02 March 2018
Accepted Date:	29 March 2018

Please cite this article as: Silvana M. Demarchi, R. Martín Torrez Irigoyen, Sergio A. Giner, Vacuum drying of rosehip leathers: Modelling of coupled moisture content and temperature curves as a function of time with simultaneous time-varying ascorbic acid retention, *Journal of Food Engineering* (2018), doi: 10.1016/j.jfoodeng.2018.03.027

Vacuum drying of rosehip leathers: Modelling of coupled moisture content and temperature curves as a function of time with simultaneous time-varying ascorbic acid retention

Silvana M. Demarchi[a,b], R. Martín Torrez Irigoyen[a,b] and Sergio A. Giner[a,c,d] *

[a] *Centro de Investigación y Desarrollo en Criotecnología de Alimentos (CIDCA), CONICET-CIC, Universidad Nacional de La Plata, 47 y 116 La Plata (B1900 AJJ), Argentina.*
[b] *Facultad de Ciencias Exactas, Universidad Nacional de La Plata, 1 y 47 La Plata, Argentina.*
[c] *Facultad de Ingeniería, Universidad Nacional de La Plata, 1 y 47 La Plata, Argentina.*
[d] *Comisión de Investigaciones Científicas (CIC), Provincia de Buenos Aires, 526 e/ 10 y 11, La Plata, Argentina.*

*Corresponding author. Address: 47 y 116, (1900) La Plata, Argentina.
Tel: +54-221-4249287. E-mail address: saginer@ing.unlp.edu.ar

Abstract

Vacuum drying kinetics, thermal histories and quality kinetics of two rosehip leather formulations were determined, at tray temperatures between 40 and 70ºC. Data was simultaneously modelled as an ordinary differential equations system encompassing a transient water balance, a transient energy balance, and a variable-order quality kinetics equation, coupled to heat and mass transfer. A set of parameters was fitted for each formulation and satisfactory representations of the experimental data were obtained. Differences in drying rate compensated for the effect of the tray temperature on quality loss, so vacuum drying at 70 ºC was recommended for rosehip leathers due to the shorter drying time required. In particular, the reaction order for ascorbic acid degradation was found to be dependent on the tray temperature.

Keywords: rosehip leather; vacuum drying; quality; mathematical modelling.

Nomenclature

AA	ascorbic acid
a_w	water activity
C_p	product specific heat (J/kg dry matter ºC)
D	water diffusion coefficient (m^2/s)
D_0	pre-exponential factor in Eq. (4) (m^2/s)
e_0	initial product thickness (m)
E_a	activation energy for drying (J/mol)
E_{aq}	activation energy for quality loss (J/mol)
F	statistic value from Snedecor distribution