Accepted Manuscript

Mathematical model for determining thermal properties of whole bananas with peel during the cooling process

Wilton Pereira da Silva, Cleide Maria D.P.S. e Silva, Leidjane Matos de Souto, Inacia dos Santos Moreira, Elaine Cristina Oliveira da Silva

PII:	S0260-8774(18)30052-9
DOI:	10.1016/j.jfoodeng.2018.02.003
Reference:	JFOE 9158
To appear in:	*Journal of Food Engineering*
Received Date:	21 November 2017
Revised Date:	27 January 2018
Accepted Date:	03 February 2018

Please cite this article as: Wilton Pereira da Silva, Cleide Maria D.P.S. e Silva, Leidjane Matos de Souto, Inacia dos Santos Moreira, Elaine Cristina Oliveira da Silva, Mathematical model for determining thermal properties of whole bananas with peel during the cooling process, *Journal of Food Engineering* (2018), doi: 10.1016/j.jfoodeng.2018.02.003

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Mathematical model for determining thermal properties of whole bananas with peel during the cooling process

Wilton Pereira da Silva*, Cleide Maria D.P.S. e Silva, Leidjane Matos de Souto, Inacia dos Santos Moreira, Elaine Cristina Oliveira da Silva

Federal University of Campina Grande, Campina Grande, PB, Brazil

*Corresponding author: wiltonps@uol.com.br http://orcid.org/0000-0001-5841-6023

Abstract

Usually, the thermophysical parameters of bananas available in the literature refer to the flesh of the product. However, to prolong the shelf life avoiding injuries, product cooling should be performed for bananas with peel (from room temperature to 13 °C). Thus, the main objective of this article was to determine thermal properties of banana with peel during its cooling. A solver was developed for the direct problem, using a two-dimensional solution of the diffusion equation to describe heat transfer. For the inverse problem, we used an experimental dataset of the temperature over time at the center of a banana, and a ready-to-use optimizer software. Convective heat transfer coefficient and thermal diffusivity were $h = (2.186 \pm 0.021)\times10^{-6}$ m s^{-1} and $\alpha = (1.45 \pm 0.06)\times10^{-7}$ m^2 s^{-1}, respectively. Heat transfer coefficient and thermal conductivity were $h_H = (4.93 \pm 0.05)$ W m^{-2} K^{-1} and $k = (0.328 \pm 0.014)$ W m^{-1} K^{-1}, respectively. The chi-square and determination coefficient of the optimization process were 3.5484×10^{-2} and 0.999955, respectively.

Download English Version:

https://daneshyari.com/en/article/6664617

Download Persian Version:

https://daneshyari.com/article/6664617

Daneshyari.com