Accepted Manuscript

Evolution of physicochemical properties of pear during drying by conventional techniques, portable-NMR, and modelling

Noemi Proietti, Giuseppina Adiletta, Paola Russo, Renato Buonocore, Luisa Mannina, Alessio Crescitelli, Donatella Capitani

PII:	S0260-8774(18)30083-9
DOI:	10.1016/j.jfoodeng.2018.02.028
Reference:	JFOE 9183
To appear in:	*Journal of Food Engineering*
Received Date:	11 October 2017
Revised Date:	15 January 2018
Accepted Date:	27 February 2018

Please cite this article as: Noemi Proietti, Giuseppina Adiletta, Paola Russo, Renato Buonocore, Luisa Mannina, Alessio Crescitelli, Donatella Capitani, Evolution of physicochemical properties of pear during drying by conventional techniques, portable-NMR, and modelling, *Journal of Food Engineering* (2018), doi: 10.1016/j.jfoodeng.2018.02.028

Evolution of physicochemical properties of pear during drying by conventional techniques, portable-NMR, and modelling

Noemi Proietti[a], Giuseppina Adiletta[b], Paola Russo[c*], Renato Buonocore[c], Luisa Mannina[a,d], Alessio Crescitelli[e], Donatella Capitani[a]

[a]Laboratorio di Risonanza Magnetica "Annalaura Segre", Istituto di Metodologie Chimiche, Area della Ricerca di Roma 1 (CNR), via Salaria Km 29,300 00015 Monterotondo (Roma) Italy

[b]Dipartimento di Ingegneria Industriale, Università di Salerno, Via Giovanni Paolo II, 132, 84084 Fisciano (SA), Italy

[c]Dipartimento di Ingegneria Chimica Materiali Ambiente, Sapienza Università di Roma, Via Eudossiana 18, 00184, Roma, Italy

[d]Dipartimento di Chimica e Tecnologie del Farmaco, Sapienza Università di Roma, Piazzale Aldo Moro 5, Roma, Italy

[e]Instituto per la Microelettronica e Microsistemi (IMM), Consiglio Nazionale delle Ricerche (CNR) Via Pietro Castellino 111 - 80131 Napoli, Italy.

*paola.russo@uniroma1.it

Abstract

The knowledge of changes in the properties of foods that occur with processing is needed for designing better drying methods that preserve desirable characteristics and minimize/eliminate undesirable ones. To this aim, this study analysed the effect of convective drying at 45-55°C on physicochemical properties of pear. The drying kinetics, shrinkage and SEM images were evaluated. Portable-NMR was used to determine the drying moisture profile of pears and thickness reduction. Portable-NMR also allowed to investigate water mobility in fresh and dried pears by measuring the longitudinal and transverse relaxation times, and the self-diffusion coefficient. Results showed that at 55°C the faster drying rate and corresponding energy saving were combined with a more uniform water distribution in pear tissues. Finally, a diffusion model considering the shrinkage during drying was developed. It assumes that all water in pear is free-water, according to NMR result that most of the water lost was from vacuole.

Keywords: portable NMR; diffusion coefficient; water compartments; drying kinetics; modelling; pear