Journal of Food Biosciences and Technology,
Islamic Azad University, Science and Research Branch, 2, 41-56, 2012

Pulsed Vacuum Osmotic Dehydration of Garlic Bulbs followed by Microwave Drying

A. Hamledari [a*], ***A. Bassiri*** [b], ***B. Ghiassi Tarzi*** [c], ***M. Bameni Moghaddam*** [d]

[a] *M. Sc. Graduate Student of Food Science and Technology, Science and Research Branch, Islamic Azad University, Tehran, Iran.*
[b] *Assistant Professor of Food Science and Technology, Institute of Chemical Technologies, Iranian Research Organization of Science and Technology (IROST), Tehran, Iran.*
[c] *Assistant Professor of the College of Food Science and Technology, Science and Research Branch, Islamic Azad University, Tehran, Iran.*
[d] *Associate Professor of Statistics, Allameh Tabatabai University, Tehran, Iran.*

Received 1 June 2011; Accepted 14 September 2011

ABSTRACT: The combination of pulsed vacuum osmotic dehydration and microwave drying of garlic bulbs were examined. The response surface methodology (RSM) was used to determine the effect of NaCl concentration (8%-20%), osmotic solution temperature (25-65°C), operation pressure (240-830 mbar), immersion time (20-300 min) and microwave power level (100-600 W) on water loss (WL), solids gain (SG), weight reduction (WR), hardness and shrinkage of samples. Analysis of the results showed that by increasing the osmotic solution concentration, temperature and immersion time, WL and WR will increase. The effect on SG was almost the same as WL except the effect of temperature. Increasing temperature resulted in an initial increase in SG for a period of time, followed by a decrease. NaCl concentration, temperature and immersion time showed the significant influence on hardness.

Keywords: *Garlic, Microwave Drying, Pulses Vacuum Osmotic Dehydration, Response Surface Methodology.*

Introduction

Garlic (*Allium sativumL.*), belongs to the *Liliaceae* family, is a common food spice, used widely in many parts of the world. Garlic is a semi-perishable spicy herb, used as a primary ingredient for preparing various kinds of foods. The moisture content of fresh harvested garlic is approximately 162% (dry basis) and the garlic is then dried to maintain its quality for prolonged storage (Ambrose & Sreenarayanan, 1998). Dehydration is an important operation in the food processing industry. The quality of dehydrated products is dominated by drying methods and conditions. Conventional hot-air drying results in extremely shrunken products with tough texture, severe browning, low rehydration rate, and low nutritive value (Huang *et al*., 2009; Krokida & Maroulis, 2000). Moreover, it is energy intensive and consequently cost intensive due to its simultaneous mass and heat transfer process accompanied by phase change (Fernandes & Rodrigues, 2007). Osmotic dehydration is a gentle way of removing water from plant tissues such as fruits or vegetables. Osmotic dehydration is carried out by immersion in a hypertonic solution. The movement of moisture from the product to the osmotic solution is governed by the difference in osmotic pressures. Not only is the moisture removed from the product but diffuse from the hypertonic solution into the product (Lombard *et al*., 2008). More than 50% of the water is taken out with the help of hypertonic solutions. After that, the fruit pieces are very soft and are still subjected to spoilage by a variety of microorganisms.

*Corresponding Author: a.hamledari@gmail.com