EFFECT OF WATER TEMPERATURE, VARIETY AND SHELF LIFE ON REHYDRATION KINETICS OF MICROWAVE DRIED POTATO CUBES

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Abstract— **In this work we compared the kinetic of the rehydration process of potatoes cubes and effects of water temperature, shelf life and variety on it. Rehydration ratio, water absorption capacity and moisture content were examined during soaking. Samples were dried in a microwave oven (300W), and subsequently rehydrated in a water bath at two temperatures (23±2ºC and 100±2Cº). Peleg's model was successfully applied to experimental data and the corresponding parameters were obtained and correlated with temperature. The parameters of the model considered were found to be greatly affected by the water temperature during rehydration. In particular the temperature increment increases the rate of rehydration and the equilibrium moisture content of the rehydrated products but shelf life decreased all the parameters.**

Keywords — **kinetic, rehydration, peleg model, potatoes, water temperature, shelf life.**

I. INTRODUCTION

A growing resistance of consumers to the use of chemical additives in the preservation of foods, combined with the rapid expansion of the fast-food industry, shows the potential for the use of dehydrated potato products, with no chemical additives, as a rehydrated product or as a component of vegetable mixtures and soups (Maskan, 2001).

Potato is one of the most important agricultural crops and there is remarkable loss of it because of unfavorable storage conditions. Therefore, it is vital to convert raw potatoes into some processed products such as dried ones.

Dehydration of food products, leading to a prolongation in their shelf life, a greater diversity and an important volume decrease, could be expanded further with improvements in product quality and process applications (Maskan, 2001). The selection of proper drying conditions is important for decreasing thermal stress and maintaining the quality of key compounds in the rehydrated product.

Various mathematical models describing the drying mechanism have been suggested for the optimization of the process and the design of an efficient drier. Such disadvantages, compounded by long drying times and low energy efficiency, have promoted research into alternative drying methods.

Microwave drying is a relatively cheap method, in which dipole heating causes water to move towards the product surface. Industrial applications of microwave energy include dehydration (Nijhuis *et al.*, 1996). Microwave drying has several advantages over conventional hot air drying, such as higher drying rate, minimal heating at locations with less water, thus reducing overheating the atmosphere, and at locations where heating is not required (Kiranoudis and Tsami, 1997; Sharma and Prasad, 2004). In microwave heating, as the temperature inside the material approaches the boiling point of water, pressure development becomes significant. This increase in vapor pressure facilitates and transfer of water to the outside (Kaensup and Wongwises, 2004; Zhang and Tang, 2006), and generates higher drying rates than conventional drying, where heat is transferred from the surface to the inside of the solids (Maskan, 2001; Khraisheh and McMinn, 2004; Sharma and Prasad, 2004). On the other hand, experimental work has shown that the use of microwaves in drying improves color and rehydration capacity, and reduces product shrinkage (Maskan, 2001).

Most of the dehydrated products are usually rehydrated during their use. Mathematical models of dehydration and rehydration operations are important in the design and optimization of those operations (Vagenas and Marinos-Kouris, 1991). It chiefly involves determination of drying and rehydration kinetics, which describe the mechanisms and the influence that certain process variables exert upon moisture transfer (Sereno and Medeiros, 1990). In typical industrial applications, kinetic models are often empirical equations involving parameters which are functions of the main process variables.

Rehydration can be considered as a measure of the injury to the material caused by drying and treatment proceeding dehydration (McMinn and Magee, 1997a). Rehydration of dried plant tissues is composed of three simultaneous processes: the imbibitions of water into dried material, the swelling and the leaching of soluble (Lewicki, 1998; McMinn and Magee, 1997b).

The objectives of the present work were to study the effect of water temperature (23±2º and 100±2º), shelf life and variety (three cultivated potatoes of Golestan province of Iran so-called Agria, Satina and Kenebek) which impress the quality of dehydrated potato cubes and their ability of water absorption in order to estimate best variety, water temperature and time of consumption.

Nomenclature:

X moisture content (kg/kg db)