OSMOTIC PRE-TREATMENT IN FRUIT PRODUCT DEVELOPMENT FROM PERSIMMONS (*Diospyros kaki*)

INTRODUCTION

Persimmon (*Diospyros kaki*) is a tropical and subtropical fruit (Sugira, 1996). In recent years, persimmon has become a familiar fruit in many countries. The leading persimmon cultivars grown in Thailand are "Fuyu" and "P2". Fuyu is non astringent and mainly eaten fresh; whereas P2 is astringent and contains high soluble tannin content which has to be removed before consumption. P2 is the most popular commercial cultivar grown in Thailand which overall quality is also excellent, productivity is high; and stores very well (Tunwirun, 2001). It is therefore desirable to utilize this cultivar by developing a high shelf-life product. The main method of preservation currently used is drying but the quality of the product obtained has limited appeal. Therefore, there is a need to develop a suitable preservation process which results in a high quality product. The use of osmotic dehydration of this fruit appears to show promise (Yuenyongputtakal, 2002).

Osmotic dehydration is a very gentle method of removing water from plant tissues which has been shown to be very effective for a number of fruits (Torreggiani, 1993; Sacchetti *et al*., 2001; Ade-Omowaye *et al*., 2002). It enables the partial removal of water by direct contact of a product with a hypertonic medium. This gives rise to two major simultaneously countercurrent mass transfer fluxes, namely water flow from the product to the surrounding solution and solute infusion into the product (Lazarides *et al*., 1995). Various osmotic agents such as sucrose, glucose, fructose, corn syrup, sodium chloride, and their combinations, have been used for osmotic dehydration. The nature of the osmotic agent used strongly influences the water removal and solid gain characteristics. The choice and concentration of the osmotic agent used depend on several factors, such as their effects on the organoleptic properties of the product, their solubility in water, their influence on cell membrane permeability and, last but not the least, their cost. The

most commonly used osmotic agents are sucrose and sodium chloride. Sometimes, sodium chloride is added in small quantities to sucrose and other solutions to increase the driving force of the drying process (Sacchetti *et al*., 2001; Ade-Omowaye *et al*., 2002).

Mass transfer rates during osmotic dehydration are influenced by several factors including the concentration of the osmotic medium, the immersion time and the temperature (Ade-Omowaye *et al*., 2002). There are several models proposed to explain the mass transfer characteristics of osmotic dehydration. These models attempt to explain the behavior of the product and the solution during the dehydration process which can be used for process design and optimisation (Silveira *et al*., 1996; Collignan *et al*., 2001).

This work presents a detailed investigation into the use of ternary osmotic media, consisting of sucrose and NaCl, for osmotically dehydrating the P2 cultivar. The investigation covers mass transfer and process design aspects, as well as product development and sensory analysis. The information gained from this research can also be applied when osmotic dehydration is used as a pre-treatment step in developing a high quality of finished product from persimmon.

The objectives of this study are:

1. To study mass transfer behavior of persimmons during osmotic pre-treatment using a ternary aqueous system consisting of sucrose and NaCl
2. To develop mathematical models for mass transfer, and finally,
3. To develop value-added fruit products from persimmons using osmotic dehydration as a pre-treatment step.