**Title** The Development of Dried Mangoes Using Osmotic Dehydration, Conventional Drying and Dehumidified Drying

**Author** Pheeraya Chottanom

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## Abstract

Osmotic dehydration is an efficient process of moisture removal from food by immersing the food in hypertonic solution such as sucrose, glucose, fructose, corn syrup, salt, etc. It is a method used for attaining better quality fruit and used for a preliminary drying period, followed by hot air drying, vacuum drying or freeze drying. The driving force of sucrose solution concentration and soaking temperature on mass transfer during osmotic dehydration of Kent and Chockanant mangoes were investigated. Desorption isotherms of fresh and osmosed mangoes have been measured and fitted by the Modified-Henderson (1967), the Modified-Halsey (1976) and the Modified-Oswin (1946) models. The convectional and dehumidified drying curve were determined and fitted by the Lewis (1921), the Henderson and Perry (1976), Zero, (2000) and the Modified-Page (1968) models.

Increasing solution concentration explicitly increased water loss and solute gain, while the highest concentration did not show the highest performance of solute gain. Increasing temperature and solution concentration encouraged water loss. However, the increasing of solute gain was less important when the temperature increased from 45°C to 60°C for 1-4 hours contact time. The corrected mass transfer coefficient ($k^{Ä}$) and concentration at the interface ($X_{Ls,i}$) depended on the mole fraction of solute in osmotic medium. The ratios of bulk flow to diffusion transport ($f_c$) of mangoes were lower than 1, indicating the low rate of dehydration. The high temperature seemed to induce the diffusion transport which is considered from $f_c$ values. Desorption isotherms for fresh and osmosed mangoes were effectively fitted to the Modified-Henderson and the Modified-Oswin models respectively both $ERH = f(EMC, T)$ and $EMC = f(ERH, T)$ and models. The Henderson and Perry model was the most effective model in describing mango drying. The drying constant, $K$ and the effective diffusivity, $D_{eff}$ were related to the drying air temperature using the Arrhenius equation. The activation energy of mangoes was in the range of 13.28-26.96 kJ mole$^{-1}$. Osmotic pretreatment caused the reduction of drying rate and moisture diffusion. However, it was associated with a reduction of drying time and drying

temperature for mango drying process. The use of a dehumidified heat pump drier reduced the drying time of mango drying process, with the exception of fresh mangoes dried at 60$^{o}$C. The fitting ability of the Henderson and Perry model could be improved by adding the exponent, *n* at the drying time. Therefore, the model was called The Modified-Henderson and Perry. The osmotic pretreatment could improve the color and texture of dried mango products.