Wanwisa Sriwimon 2010: Development of Jet Impingement Freezing for Ripe Mangoes (cv. Nam Dok Mai). Master of Science (Food Engineering), Major Field: Food Engineering, Department of Food Science and Technology. Thesis Advisor: Assistant Professor Waraporn Boonsupthip, Ph.D. 109 pages.

Frozen ripe mango (cv. Nam Dok Mai) is a Thai fruit which is globally popular. It is texturally damaged due to formation of ice crystals during freezing preservation. The first objective of this investigation was to optimize ripe mango preparation for freezing process. Partially ripe mango was used as an alternative of ripe mango. Based on its stronger structure, partially ripe mango could better withstand texture damage by ice crystals. Its flavor and color could be enhanced by impregnation of mango juice and sugars (natural flavor) into the mango matrix. This investigation found that calcium carbide incubation for two days helped prepare the mango at a partially ripe state. Vacuum infusion was more effective than natural mass diffusion in incorporation of mango juice-sugar mixture (shorter soaking time (~10 min at 74.66 kPa) and better mango quality (texture, solid content and color sensory scores ~ 7 – 8 in a traditional 9- point hedonic scale). After freezing (air-blast, jet-impingement (JI) and cryogenic freezing) and thawing, the juice/sugar-infused mangoes were high in sensory scores (7 – 8) and low in drip loss (9 – 12 g/100g) values. They better tolerated freezing damage than did ripe mango. This proposed method can help reduce the post-harvest losses arising from the faster spoilage of more ripe mangoes. It enhances natural flavor and taste of the partially forced ripening mangoes which normally impart only color. The second objective of this investigation was to evaluate the potential use of JIF with cool air for frozen partially ripe and ripe mango (incubated with calcium carbide for 2 and 3 days) as an alternative. JIF is a novel freezing technology which applies cool air at high velocity. The air is controlled to perpendicularly strike onto food surface to better reduce the inherent air insulation around the food surface than directionally uncontrolled air like air-blast freezing. In the JIF experimental process, the air velocity (v = 15, 25 and 35 m/s for one upper jet nozzle and v = 10, 15 and 20 m/s for upper and lower jet nozzles) and the ratio of distance between nozzle and mango surface, and nozzle diameter (H/D = 5, 6 and 7) were varied. It was found that partially ripe and ripe mangoes after frozen at proper jet impingement conditions (H/D = 6, v = 35 m/s) had as best quality as those frozen with liquid nitrogen.

_____ _____ ___ / ___ / ___

Student's signature Thesis Advisor's signature