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**STUDIES ON POSTHARVEST QUALITY OF 'BUOI'  
MANGOES DURING COLD-STORAGE**

**A thesis submitted in partial fulfilment  
of the requirements for the degree of**

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**in**

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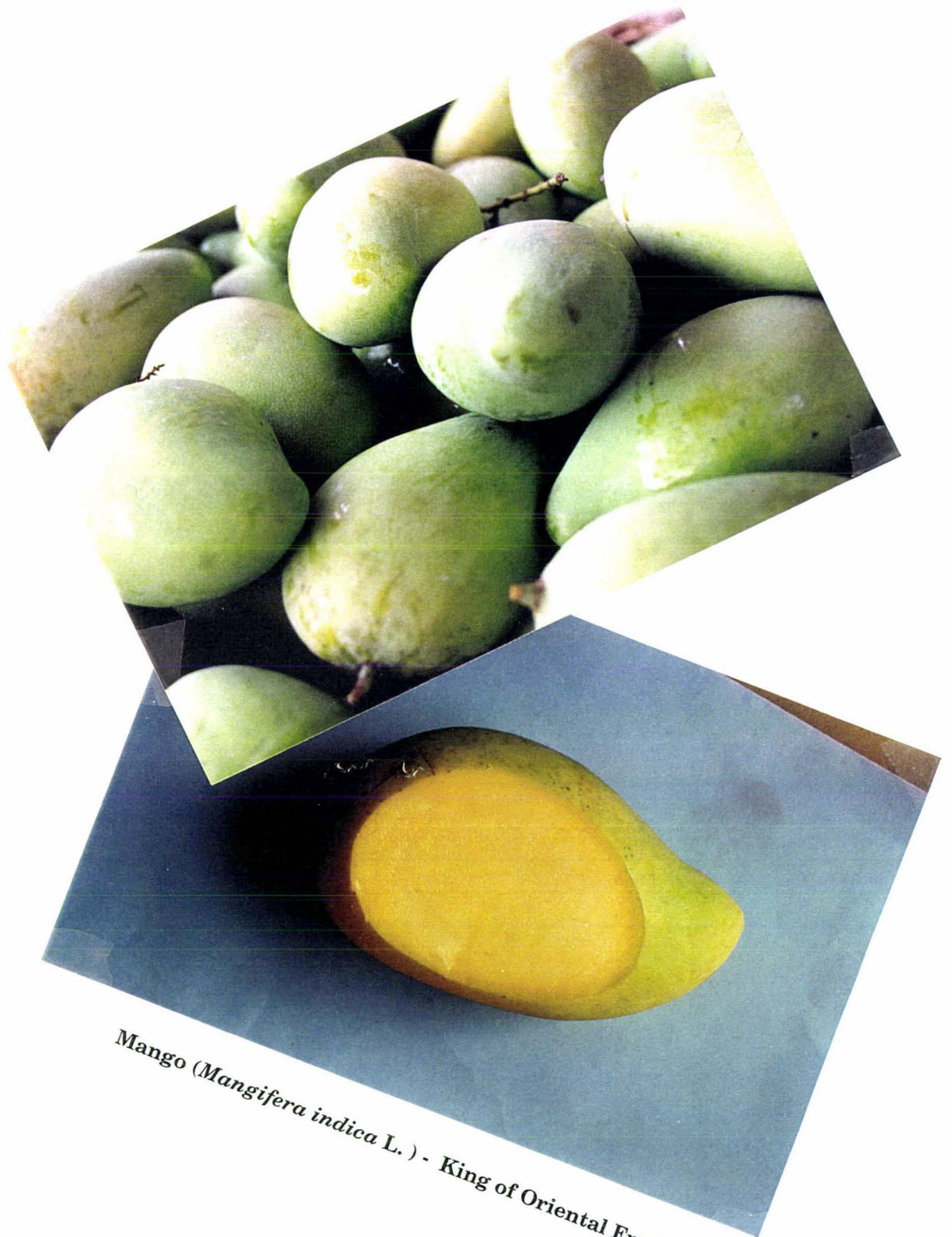
**Nguyen Xuan Ha**

**1998**

# VIETNAM



Tien Giang  
Province



Mango (*Mangifera indica* L. ) - King of Oriental Fruits

## ABSTRACT

The objective of this thesis was to characterise the postharvest quality attributes of 'Buoï' mangoes by: (1) providing a detailed review of the literature on postharvest handling and storage of mangoes; (2) studying the effects of harvest date, storage temperature, length of storage, and postharvest treatments on postharvest quality of 'Buoï' mangoes; and (3) developing regression models for predicting postharvest quality attributes of 'Buoï' mango fruit as a function of storage temperature and length of storage.

A review of the literature showed that considerable research has been carried out during the last 20 years on several aspects of postharvest handling and storage of mangoes. The literature review included maturity assessment, ripening behaviour of mangoes at low temperature storage, and postharvest treatments for controlling diseases and disorders. Many researchers have recommended storage conditions and postharvest treatments for various mango cultivars such as 'Alphonso', 'Carabao', 'Kensington', 'Haden', 'Keitt', 'Kent' etc., however, there was a dearth of information on the storage requirements for the important cultivars grown in Vietnam.

Samples of 'Buoï' mango grown in Hoa Loc area, Cai Be District, Tien Giang Province (latitude: 10° 5', longitude: 102°), Vietnam, were harvested at commercial maturity on three harvest dates based on uniform peel colour and morphological characteristics such as size and shape and transferred to laboratory at the Postharvest Technology Institute (PHTI) in Hochiminh city. To study the effects of harvest date on mango quality, fruit samples from the three harvests were stored at  $12 \pm 1^{\circ}\text{C}$  (RH 85-90%) for 25 days. At 5-day intervals, sub-samples were randomly removed from cold storage and assessed for weight loss, peel and pulp colour, soluble solids content (SSC), total acidity, flesh firmness and crushing stress, chilling injury (CI) and eating quality. Another sub-sample was assessed after 4 days ripening at 25°C. The results showed that increasing storage time led to a significant ( $P <$

0.05) increase in weight loss, peel and pulp colour development, and incidence of chilling injury. However, both fresh firmness and crushing stress, and total acidity declined during storage. Soluble solids content and eating quality increased up to around 20 days, but declined afterwards.

Harvest date influenced weight loss, CI and fruit texture (both firmness and crushing stress), but did not affect peel and pulp colour, SSC, total acidity, and eating quality. Early harvested fruit lost more weight compared with the mid- and late harvested fruit. However, there was no significant difference in weight loss between mid- and late harvested fruit. Up to 10 days storage, fruit texture in early harvested fruit was significantly higher than in mid- and late harvested fruit, but after this period the difference disappeared. Early harvested fruit were more susceptible to CI than mid- and late harvested fruit. Compared to fruit kept in cold storage, fruit ripened at 25°C had higher SSC but were lower in total acidity. In addition, ripening fruit at 25°C increased the severity of CI.

To study the effects of storage temperature on mango quality, fruit samples from second harvest were stored at 7, 12, 17 ± 1°C (RH 85-90%), and room temperature (27°C, RH 75-85%) for 25 days. Storage temperature had a significant effect on fruit quality attributes. Increasing storage temperature led to increase in weight loss, and yellow colour development in peel and pulp tissue; however, firmness, crushing stress, total acidity and incidence of CI declined. In cold-stored fruit, soluble solids content and eating quality increased with increase in storage temperature. Storing fruit at 12°C up to 20 days and 17°C up to 15 days, respectively, maintained the quality and minimized the incidence of postharvest disorders in 'Buoï' mangoes. Regression models for predicting postharvest quality attributes of 'Buoï' mangoes as a function of storage temperature and storage time were developed, applicable for fruit storage in the range 7 - 27°C up to 15 days and 7 - 17°C up to 25 days.

To assess the effect of hot water treatment (HWT) for controlling of postharvest diseases and disorders in 'Bui' mango, fruit samples were randomly assigned to the following treatments prior to cold storage at  $12 \pm 1^\circ\text{C}$  (RH 85-90%): treatment 1 = fruit dipped in hot water at  $52^\circ\text{C}$  for 5 min; treatment 2 = fruit dipped in hot water at  $52^\circ\text{C}$  for 10 min; treatment 3 = fruit placed in PVC plastic bag; and treatment 4 = control (untreated) fruit. After 24 days storage, fruit were removed from cold storage and assessed for weight loss, peel and pulp colour, SSC, anthracnose, stem-end rot, shrivel and CI. HWT at  $52^\circ\text{C}$  for 5 or 10 min significantly reduced the incidence of anthracnose, stem-end rot and CI compared to fruit in plastic bag or untreated fruit. Fruit in plastic bag lost less weight than the other treatments. HWT at  $52^\circ\text{C}$  for 5 min was recommended for reducing the incidence of anthracnose, stem-end rot and CI in Vietnamese 'Bui' mangoes.

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**LIST OF ABBREVIATIONS**

ANOVA	= analysis of variance
<i>a</i>	= blade radius, m
<i>b</i>	= blade width, m
CA	= controlled atmosphere
CI	= chilling injury
CO <sub>2</sub>	= carbon dioxide
EQ	= eating quality
HHHA	= high humidity hot-air
HI	= hyperthermal injury
HWT	= hot water treatment
ISFV	= International Standardisation of Fruits and Vegetables
ISO	= International Standard Organisation
<i>k</i>	= coefficient of individual acid
<i>M</i>	= maximum moment produced when the aim is horizontal
MA	= modified atmosphere
MAP	= modified atmosphere packaging
min	= minutes
<i>n</i>	= amount of NaOH 0.1 N
O <sub>2</sub>	= oxygen
<i>P</i>	= weight of the sample
PE	= pectinesterase
PG	= polygalacturonase
RH	= relative humidity
R <sup>2</sup>	= regression coefficient
SAS	= statistical analysis system
sec	= seconds
SSC	= soluble solids content
<i>T</i>	= storage time
TA	= total acidity
Temp.	= temperature

VHT	= vapour heat treatment
Wr	= weight loss rate
Wi	= initial weight
Wa	= weight after removal from cold storage
$\sigma_{cr}$	= flesh crushing stress