

A Manual of Postharvest Handling Systems for Perishable Food Crops

No. 001
Mango (*Mangfera indica*·L)

IICA-CIBIA

IICA



IICA
PM-A2/
TT-87-
001



RESEARCH DIVISION
MINISTRY OF AGRICULTURE, LANDS AND FOOD PRODUCTION
TRINIDAD & TOBAGO
AND

IICA



INTER-AMERICAN INSTITUTE FOR CO-OPERATION ON AGRICULTURE

IICA OFFICE IN TRINIDAD & TOBAGO
PORT-OF-SPAIN, TRINIDAD & TOBAGO
DECEMBER, 1986

.....
.....
.....

.....

.....

... ..
... ..
... ..
... ..
... ..

REPUBLICA DE VENEZUELA
*
... ..
... ..

11 CA
ON: A21TT
87-001

BV- 520 C.1
~~000981 C.2~~

00001542

FOREWORD

Improvement in food self-sufficiency and food security in Trinidad and Tobago will depend to some extent on improvements in the marketing system for food crops. In 1985, the Government of Trinidad and Tobago requested IICA's assistance in the preparation of project proposals for establishment of a marketing system for food crops which would embrace aspects of packaging, handling and postharvest technology.


A mission visited Trinidad and Tobago from August 25th to 31st, 1985 and prepared "Proposals for the improvement of domestic marketing of fruits and vegetables in Trinidad and Tobago".

On the subject of Research and Training the mission observed that "a national course in postharvest technology and marketing seems necessary".

In pursuing the implementation of the proposed national course in postharvest technology, it became clear that local materials for use in postharvest training were extremely limited. In view of this, IICA sought to assist in the preparation of local training material for use in a national course in postharvest technology and marketing. This publication on the postharvest technology of mango (*mangifera indica* L.) is the first result of joint efforts by IICA and scientists of the Ministry of Food Production, Marine Exploitation, Forestry and the Environment to prepare local materials which can be utilized in training programmes designed to improve the marketing systems and reduce postharvest losses in food crops.

This publication is timely and important because while there is abundant literature on postharvest technology of temperate fruit crops, there is limited information on tropical fruits.

I hope that this represents the beginning of the production of a series on the postharvest technology of tropical crops which will have application not only in Trinidad and Tobago but throughout the tropical world. Our Institute is pleased to have collaborated with the Ministry of Food Production, Marine Exploitation, Forestry and the Environment in this venture and looks forward to co-operating in future initiatives which will contribute to reducing postharvest losses in tropical crops.



Chelston W.D. Brathwaite
Director
IICA Office in Trinidad and Tobago

PREFACE

Developing countries often find themselves in the situation where locally grown produce arrives on domestic markets in less than excellent condition and attempts at marketing in the potentially lucrative markets of North America and Europe encounter problems of quality, both from the quarantine viewpoint and overall quality standards.

The goal of achieving a developed marketing system which satisfies both domestic and foreign requirements has remained somewhat elusive for many a tropical developing country.

The reasons for the above condition are varied amongst them being the lack of a well informed farming community highly sensitive to the need to produce a quality product and willing to engage in the steps necessary to ensure good product life and final consumer acceptance.

It is towards the fulfilment of this condition that this series of manuals directs attention.

They attempt to put together the various techniques (generally grouped together as "post harvest technology") that must be applied to a particular commodity not only to ensure quality but minimize total product loss.

The series treats the problems of perishables, more particularly the commodity groupings (1) Fruits (2) Vegetables (3) Roots and Tubers and (4) Ornaments. The approach consists of an examination of the operations that occur between harvest and market, identification of common problem areas and practical recommendations to the grower.

Although intended for the grower and Extension Officer mainly, it is hoped that it can also be a useful source of information for administrators, entrepreneurs etc., and even our colleagues in temperate countries with an interest in the post harvest technology of tropical perishables.

This manual represents the first in a series out of the joint efforts of IICA, Trinidad and Tobago Office and the Post Harvest Unit of the Ministry of Agriculture (MOA) Trinidad and Tobago.

It is hoped that the package of technical information provided is supportive not only of the Government of Trinidad and Tobago's efforts in the area of improved marketing but attempts in other developing countries where mango assumes importance.

It is hoped that critical comments and suggestions especially in the area of

new and improved post harvest techniques for the small to medium sized grower would be part of a constant feedback from users throughout this series.

Correspondence concerning this publication should be addressed either to:

**Director
IICA Office
Trinidad and Tobago**

or

**The Research Division
Ministry of Food
Production
Trinidad and Tobago**

**L.H. Sealy
Head Post Harvest
Unit
Ministry of Agriculture
Trinidad and Tobago**

28th January, 1987

ACKNOWLEDGEMENTS

As head of the Post Harvest Unit, Ministry of Agriculture, Trinidad and Tobago, I would like to thank:

- (1) Mrs. A. Mootoo for the preparation of the manual.
- (2) Staff members - Mr. M. Mohammed and J. Rosales for the co-operative attitude they demonstrated.
- (3) Ms. C. Persad – Plant Pathologist, MOA
- (4) Mr. O. Noel and Mr. R. Ramoutar – Technicians, MOA
- (5) Staff of Citrus Research Unit, MOA – Provision of Fruits
- (6) Staff of Northern Range Reafforestation Project, MOA – Provision of Fruits.
- (7) Mr. C. Ross – Cartographer, MOA
- (8) Ms. E. Graham – Typist, MOA
- (9) IICA Office in Trinidad and Tobago – Funding

MOA – Ministry of Agriculture.

TITLE: A Postharvest Handling System for Mangoes (*Mangifera indica*-L)

TABLE OF CONTENTS

1.0	Introduction	1
2.0	Varieties and Variety Selection	1
3.0	Harvest	5
3.1	Maturity	5
3.2	Harvesting Method	5
3.3	Temperature Management in the Field	8
4.0	Grading and Standardization	9
5.0	Packing House Operations	14
5.1	Washing and Fungicidal Treatment	14
5.2	Sorting	16
5.3	Sizing	16
5.4	Packing and Packaging	16
6.0	Transportation	17
7.0	Storage	18
8.0	Diseases and Disorders	21
9.0	Summary	26

As he
bago,

(1) '

(2)

(3)

(4)

(5)

(6)

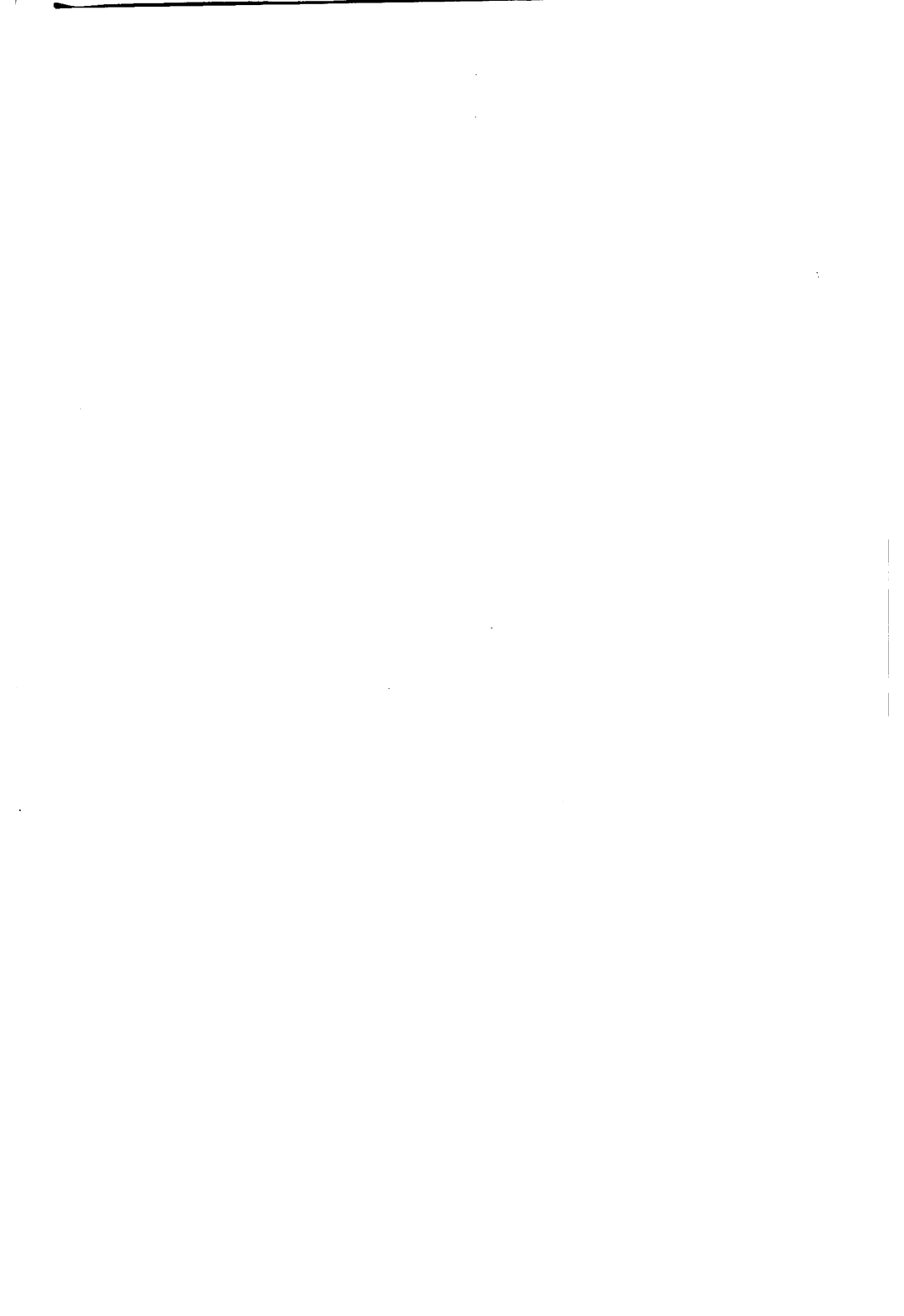
(7)

(8)

(9)

MC





Errata

Cover line 6 should be “*Mangifera indica*”.

Page 1 line 30 should be “amchar”.

Page 6 line 3 “the author” should read “Postharvest Unit”.

Page 17 line 8 should read “with a damp”.

Page 19 line 1 should read “conducted by the Postharvest Unit”.

Page 20 Plate 28 Caption should read “sealed polyethylene bags”.

Page 21 line 3 should read “*Colletotrichum gloeosporioides*”.

Page 22 line 7 should read “indicate”.

MOA = Ministry of Agriculture.
= Ministry of Agriculture, Lands and Food Production.
= Ministry of Food Production, Marine Exploitation,
Forestry and The Environment.

1.0 Introduction

Although the challenge to retain good marketable quality and reduce postharvest losses of tropical fruits is a difficult one, there is much that can be, but is not currently done to this end in Trinidad and Tobago.

Tropical fruits, unlike their temperate counterparts are exposed to high ambient temperatures (28°C - 32°C) and high relative humidities (90 - 95%). These climatic conditions facilitate high respiratory rates and hasten the processes of ripening and senescence thus reducing the shelf life of tropical fruits. Tropical climates also encourage the proliferation of many disease-causing organisms which give rise to rotting and spoilage of fruits. Insect populations in the tropics cause substantial damage to fruits both in the pre and postharvest periods. It is clear that the postharvest life of tropical fruits is affected by a complex interaction of many adverse factors.

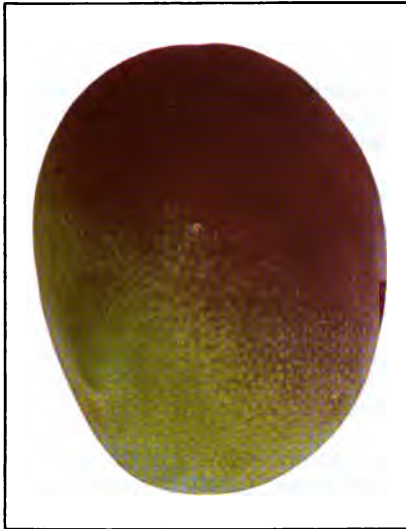
With careful consideration of the postharvest environment of tropical fruits, this manual attempts to outline a recommended handling system for the mango fruit (*Mangifera indica*). It is hoped that these recommendations would assist in the improvement of the postharvest technology of this fruit in developing tropical countries.

2.0 Varieties and Variety Selection

There are hundreds of mango cultivars grown over the world. The nomenclature of mango cultivars has been complicated due to the existence of synonyms so that similar cultivars grown in different areas may have different names.

The selection of a particular variety for cultivation should depend on the intended use of the mangoes. Varieties with good potential for the export market are 'Haden' and 'Tommy Atkins' (Plates 1 and 2). These varieties are attractively colored, ship well and ripen with good quality. Varieties with good potential for the domestic fresh fruit market are 'Starch' and 'Julie' (Plates 3 and 4), these being the two most popular varieties among Trinidadians. For processing into pickles, chutneys and anchar the 'Rose' and 'Long' (Plates 5 and 6) are extremely good varieties.

These cultivars are only some of the examples suitable for either the export market, the domestic fresh fruit market or for processing. There are other suitable cultivars which can be used for these purposes. However, emphasis would be placed on these cultivars throughout this manual as they were readily available for laboratory and field studies.



1 'Haden' at green mature stage



2 'Tommy Atkins' at green mature stage



3 'Starch' at green mature stage



4 'Julie' at green mature stage



5 'Rose' at green mature stage



6 'Long' at green mature stage

Table 1 describes the physical characteristics of these 6 varieties of mangoes.

TABLE I Physical Characteristics of Some Mango Varieties obtained in Trinidad, West Indies.

EXPORT MARKET	VARIETY	Colour		Mean wt. (g)	Mean length (cm)	Mean Circumference (cm)	Mean Skin Thickness (cm)	Mean % Edible Pulp	Mean Seed wt. (g)	Pulp: Seed Ratio
		Mature stage	Ripe							
EXPORT MARKET	1. TOMMY ATKINS	dark green with purplish bluish	yellow with bright red bluish	586	11.5	30.8	0.21	76.78	47.75	8.5:1
	2. HADEN	light green with red bluish	yellow with scarlet bluish	411	13.4	26.5	0.23	70.92	34.31	7.9:1
DOMESTIC MARKET	1. JULIE	green sometimes with purplish bluish	brown/yellow with red bluish	276	11.6	23.3	0.14	69.37	30.49	5.5:1
	2. STARCH	green	primrose yellow	144	7.45	19.34	0.17	60.34	24.75	3.2:1
PROCESSING (chutneys, pickles)	1. LONG	green	light yellow	216	10.8	20.88	0.16	57.83	45.37	2.8:1
	2. ROSE	green with purplish bluish	yellow with red bluish	238.7	8.83	24.4	0.1	63.20	44.27	2.9:1

3.0 Harvest

3.1 Maturity

Mangoes should be harvested in a physiologically mature but unripe stage; approximately 120 - 125 days after flower induction. The precise stage of maturity at which fruits are harvested should depend to some extent on market distance. For distant markets (e.g. for export), fruits should be dark green in color but their cheeks must be filled out as evidence of physiological maturity. For nearby markets fruits may be light green in color at harvest.

3.2 Harvesting Method

Mangoes are manually harvested. For fruits that are within reach, harvesting may be done by snapping or clipping the pedicel (fruit stalk) at the base of the fruit (Plate 7). The fruit is twisted sharply sideways or upwards to break the pedicel. To avoid stem punctures, any long pedicels should be trimmed flush with the stem end of the fruit (Plate 8).



7.

Hand-harvesting of fruits on low branches



8 Trimming of pedicels

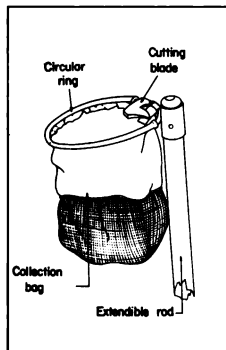
Fruits on high branches should be harvested with a picking pole designed to pick fruit easily and without damage (Plate 9). A convenient picking pole (approximate cost, \$25 US) adapted and tested by the author was found to be efficient in harvesting mangoes without causing damage. This picking pole (Plate 10) consists of 4 simple parts:

- (i) Collection bag: the bottom half of which is made of see-through nylon mesh and the top half of durable canvas. The see-through mesh enables the picker to see the fruit and accurately position the cutting blade against the pedicel of the fruit.
- (ii) Circular ring, (approximate diameter of 16 cm), made of a mild steel rod.
- (iii) An extendible rod inserted into a cylindrical metal pipe which is welded onto the circular ring.

- (iv) **Cutting blade:-** Fruits are positioned inside the collection bag and the pedicel is cut with the sharp blade by a lateral movement of the picker's arm. The fruits when detached are held in the collection bag. Picking may be repeated a few times before emptying the collection bag, but caution and discretion must be exercised by the picker to avoid abrasion damage caused by the fruits rubbing against each other in the bag.



9 Harvesting of fruits with picking pole



10 Figure of Picking Pole

3.3 Temperature Management in the field

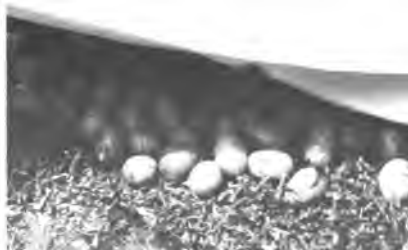
After the mangoes are harvested, they must be protected from the direct rays of the sun, in an effort to prevent excessive fresh weight loss and shrivelling of the fruits. Useful tips to achieve this end are:-

- (a) Use of natural shade (Plate 11)
- (b) Covering harvested fruit with light coloured, damp cover. (Plate 12)
- (c) Sprinkling produce with clean fresh water. (Plate 13).

Commodities exposed to sunlight lose approximately four times as much water as those that are kept in the shade.



11



12



13

4.0 Grading and Standardization

There is no internationally recognized grading system for mangoes. However, there are numerous advantages to be derived from a grading system. The purchaser is assisted since it is possible to buy more precisely what is desired; to buy by description rather than having to inspect every fruit; and to be assured of consistency in quality at every purchase.

The seller is also assisted by a grading system since it is possible to sell products closer to what consumers desire and to establish price differentials with higher grades fetching a higher price than lower grades.

The establishment of a grading system for mangoes is complicated by the existence of numerous varieties of mangoes, each of which have their own characteristic size, shape, colour, texture and flavor. However, a suggested grading system for four popular fresh fruit varieties of mangoes will be presented.

Grade A shall consist of fruits that are:-

- (i) at the mature green stage of development (immature/ripening fruit would not be acceptable).
- (ii) free from deformities;
- (iii) free from insect and pest damage;
- (iv) free from mechanical damage;
- (v) free from anthracnose spots;
- (vi) free from dark latex stains;
- (vii) trimmed of their pedicels;
- (viii) not less than weights quoted below for specified varieties.

Tommy Atkins	—	642g
Haden	—	465 g
Julie	—	300 g
Starch	—	175 g



14 'Tommy Atkins'
- Grade A fruit



15 'Haden'
- Grade A fruit



16 'Julie'
- Grade A fruit



17 'Starch'
- Grade A fruit

Grade B shall consist of fruits that:-

- (i) do not have greater than 10% of their surface area affected with anthracnose spots;
- (ii) do not have more than 1% of their surface area contaminated with dark latex stains; and
- (iii) are not less than weights quoted below for specified varieties.

Tommy Atkins	-	500 g.
Haden	-	350 g
Julie	-	275 g
Starch	-	120 g

Characteristics (ii, iii, v, vi, viii) of Grade A would also hold for Grade B. Plates 18 - 21.



18 'Tommy Atkins' - Grade B Fruit



19 'Haden' - Grade B Fruit



20 'Julie' - Grade B Fruit



21 'Starch' - Grade B Fruit

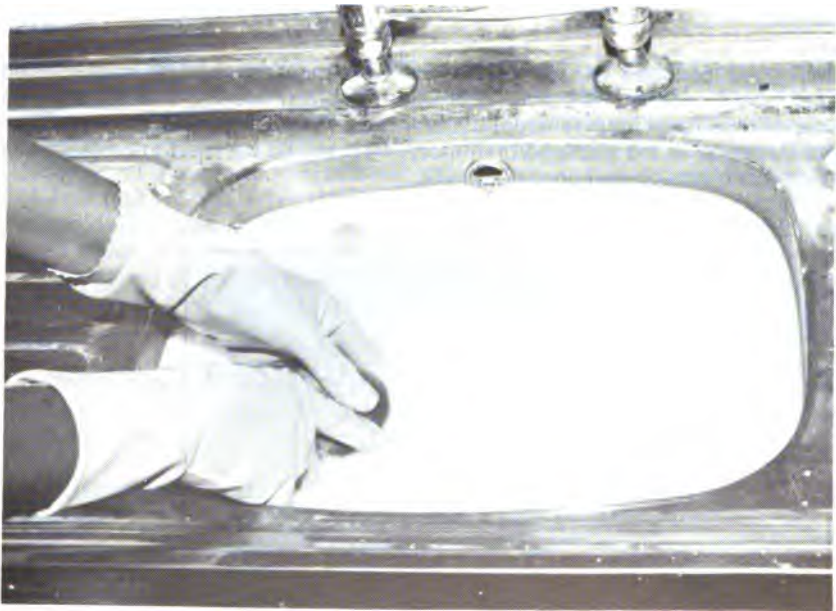
5.0 Packing House Operations

5.1 Washing and Fungicidal Treatment

Mature green mangoes exude large amounts of latex from the cut stems. If allowed to stay on the fruit, the latex oxidizes and leaves unattractive dark stains on the fruit (Plate 22) so fruits must be washed after harvest. The water may contain benomyl (tradename Benlate) fungicide to control anthracnose. Plate 23 illustrates this operation.



22 Latex-stained mangoes



23 Washing mangoes in water containing Benlate

5.2 Sorting

Sorters examine mangoes as they pass on a moving belt. Immature, overmature or undersized fruits and fruits exhibiting scars or defects are diverted.

5.3 Sizing

Sizing may be done by the eye or other mechanical means. Fruits of the desired size for specific grades are put together from a moving return-flow-belt. This is an essential operation for an effective grading system.

5.4 Packing and Packaging

For the domestic market, fruits may be packed in ventilated wooden boxes or corrugated cardboard boxes with a net capacity of 18 - 20 kg. Fruits should not be packed more than two layers deep.

The use of bags should be avoided for packing mangoes. In addition to boxes being stackable, facilitating greater quantities per load for transportation, they offer better ventilation and greater protection against damage than bags.

Mangoes destined for the export market should be packed in ventilated cardboard cartons. One-layer flats with dividers (Plate 24) with a maximum capacity of 8 kg. may be used. If it is necessary to have more than one layer of mangoes in the package unit, then liners should be used to protect fruits from compression damage, (Plate 25).



24 One Layer Box with Dividers



25 Cardboard Carton with Liners

6.0 Transportation

Mangoes intended for the domestic market need not be transported under strictly controlled temperature conditions as this is extremely costly; and in any event, these mangoes would be sold and consumed in a relatively short time period. However, efforts must be made to protect the fruits from the direct rays of the sun to reduce fresh weight loss, shrivelling and deterioration of fruit quality. It is advisable to transport mangoes during the cooler part of the day. Crates or boxes of fruits should be covered with damp, light colored cover. The cover should not rest directly on the mangoes but should be supported at the ends and middle so as to maintain an air space between the cover and the fruits. This would ensure adequate ventilation of the fruit load.

During transportation, it is essential to minimize damage caused by abrasion, vibration or compression, in order to maintain quality of the mangoes. Tips to achieve this are:-

- (i) Grading of roads.
- (ii) Reduction of transport speeds.
- (iii) Reduction of tyre pressure on vehicles - this reduces the shock absorbance of the produce.

- (iv) **Avoid piling crates that are not stackable, one on top of another. Provide detachable support for crates inside transport vehicles to allow for single layer transport.**

Mangoes intended for export require strictly controlled temperature conditions during transport. Although air-freight is quicker than transport by sea, the high cost may render it prohibitive. Transport by sea with refrigeration is considerably cheaper. A temperature of 7°C (45° F) for West Indian mango is approximately the minimum tolerated without chilling injury but renders the fruits more susceptible to anthracnose infection. Therefore mangoes should not be transported at temperatures below 13°C (55°F).

7.0 Storage

As a general rule, only good quality mangoes that are clean, mature and free from disease and injury should be selected for storage. Diseased fruits may infect sound ones. Injured fruits are easily infected, as sites of injury serve as avenues for the entry of micro-organisms. Immature fruits do not have the potential for lasting long in storage and usually ripen with inferior quality. Unwashed, dirty fruits serve as sources of infection in storage.

There must be a minimum of delay between harvest and storage. Mangoes should be put into storage containers that are able to withstand stacking without becoming deformed and injuring fruits.

Ripe and unripe mangoes must never be put into the same storage room as ripe fruits give off ethylene which will hasten the ripening of adjacent un-ripe fruit. If commodities other than mangoes are to be put into the same storage room, one has to ensure that the particular commodity is compatible in storage with mangoes. For example citrus fruits, onions, give off a characteristic odour which would be absorbed by the mangoes and adversely affect its eating quality. Such commodities therefore must not be stored with mangoes.

Sanitation in the storage room is extremely important. Storage containers and storage rooms must be cleaned between storage periods to prevent disease contamination from previous batches of fruit.

Mangoes have an inherently short shelf life of about seven days from the green mature to the ripe stage under ambient conditions. Refrigerated storage can be used to extend storage life. The best storage temperature for mangoes is 13°C (55°F) at which temperature the storage life ranges between 2 - 3 weeks. Storage below this temperature results in chilling injury of the fruit (see below) and increases susceptibility to anthracnose infection.

Preliminary investigations conducted by the author at the Postharvest Unit (MOA), suggests that Semperfresh (a fruit surface coating) retards ripening of mango fruits and thus extends their storage life. Plates 26 and 27 illustrates the degree of ripeness of treated and untreated 'Haden' and 'Long' mangoes after seven days under ambient conditions. Notice that while untreated fruits of both varieties were fully coloured and ready for consumption after seven days; the fruits treated with Semperfresh were still green and firm. Treated fruits got to the eating-ripe stage after a further five days.

10 days of life followed by
4-day storage under ambient conditions



Untreated fruit



26 Effect of Semperfresh on storage life of 'Haden' mangoes

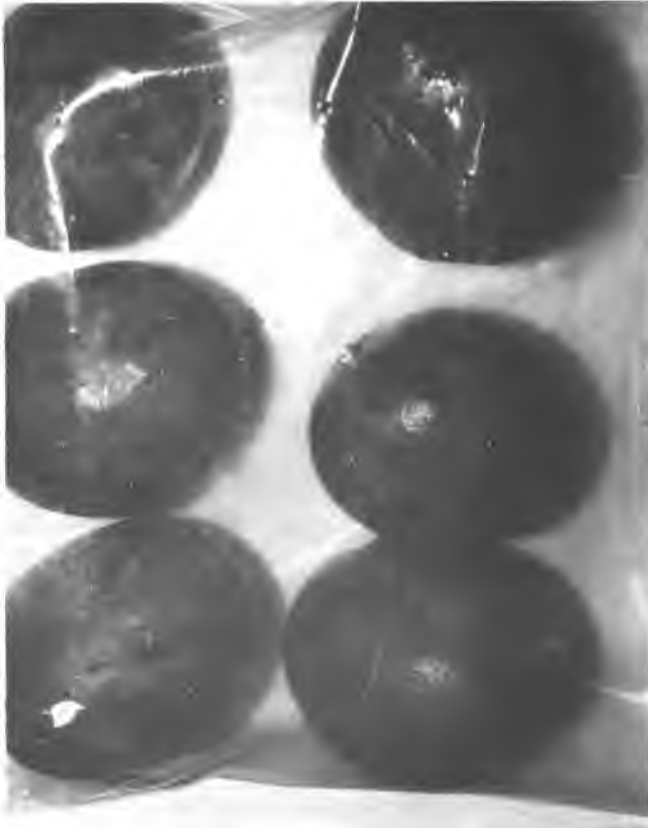


27 Effect of Semprefresh on storage life of 'Long' mangoes

Polyethylene bags may also be used to extend the storage life of mangoes. Polyethylene film provides a modified atmosphere condition which delays the normal ripening process. Excessively long exposures however can lead to "soft green" fruits with high incidence of anthracnose. For short storage periods, unperforated sealed polyethylene bags (Plate 28) may be used; but for longer storage periods, bags should be punctured with pin-prick perforations (Plate 29).



28
Storage of mangoes in
unperforated sealed by Polyethylene bags



29 Storage of mangoes in perforated sealed Polyethylene bags

8.0 Diseases and Disorders

1. Anthracnose – (sometimes referred to as 'black spot') Plate 30 .

This disease caused by the fungus *colletotrichum gloeosporiodes* is probably the most important disease of mangoes. It usually appears on the fruit only as it ripens. The spots first appear as very small brown areas that enlarge rapidly and become black. Often the entire fruit surface is covered by the coalescing of the spots. The affected areas usually crack and sink slightly.

Decay is usually confined to the peel of the fruit but in later stages it may penetrate the flesh in shallow areas. Anthracnose decay does not usually affect the edibility of the fruit because of its shallow penetration. However the lesions detract markedly from appearance and therefore could reduce the selling price of fruits where an accepted grading system is effective.



30 Mango fruits infected with anthracnose

Control:

Anthracnose control must start during the preharvest life of the fruits. Field trials conducted by the Plant Pathology Section of C.E.S., MOA, indicates that good control of anthracnose of 'Julie' mangoes is obtained by the following spray programme:—

Apply fungicide(s) at 14 day intervals using a motorized mist blower at

- (a) flowering up to early fruit set - 4 applications; and
- (b) fruit set to fruit maturity - 2-4 applications.

The recommended spray programme is as follows:

- 1st application: Benlate and Dithane M45
- 2nd application: Either Dithane M45 or Cuprosan
- 3rd application: Benlate and Dithane M45
- 4th application: Either Dithane M45 or Cuprosan
- 5th application: Benlate and Dithane M45

Fungicide rates are as follows:

Benlate:	0.5 - 1kg/ha or 200 g/1000 litres water
Dithane M45:	3.3 kg/ha or 400 g/1000 litres water
Cuprosan:	4 kg/ha or 400 g/1000 litres water

The following postharvest dips as follow-ups to the pre-harvest treatments may be used to ensure protection against anthracnose infection:-

- (i) Dip in hot water at 55°C for 5 minutes.
- (ii) Dip in hot (52°C) 0.1% benomyl (tradename Benlate) for 1 - 3 minutes.

Investigations conducted by the author at the Postharvest Unit, C.E.S., MOA, have indicated that the fungicide thiabendazole (tradename Tecto) is not effective in the control of anthracnose in mangoes.

2. Stem-End Rot. (Plate 31)



31 Mango fruit infected with stem-end rot

This disease caused by the fungus *Diplodia natalensis* P.Evans, is another serious disease of mangoes. Once the rot starts it spreads rapidly making the fruits unfit for consumption.

Hot water treatment alone does not control stem-end rot in mangoes. However, dipping mangoes for 1 - 3 minutes in hot (52°C) 0.1% benomyl gives some control of stem-end rot.

3. Chilling Injury (Plate 32)

This is a disorder of mangoes caused by exposure to temperatures below 13°C (55°F). Symptoms of chilling injury include:-

- (a) grayish scald-like discoloration of the skin
- (b) pitting (sunken spots)
- (c) uneven ripening
- (d) poor flavour development
- (e) poor colour development



32 Chill-Injured Mango

4. Scarring. (Plate 33)

This occurs when the mango suffers physical injury during its development. Scarring reduces the eye-appeal of the fruit and therefore reduces selling price.



33
'Tommy Atkins'
mango with scar

5. Internal Breakdown (Plate 34)

The external appearance of the mango fruit is not affected by internal breakdown. However, when the fruit is cut open, there is a significant reduction in flesh firmness and a fermented odor may be detected. If the fruit has reached the half-ripe or fully ripe stage, one can clearly see a separation of the mesocarp from the seed.

Internal breakdown is thought to be related to the calcium and potassium levels in the fruit. This implies that one must assure an appropriate fertilizer regime in the management of mango orchards.



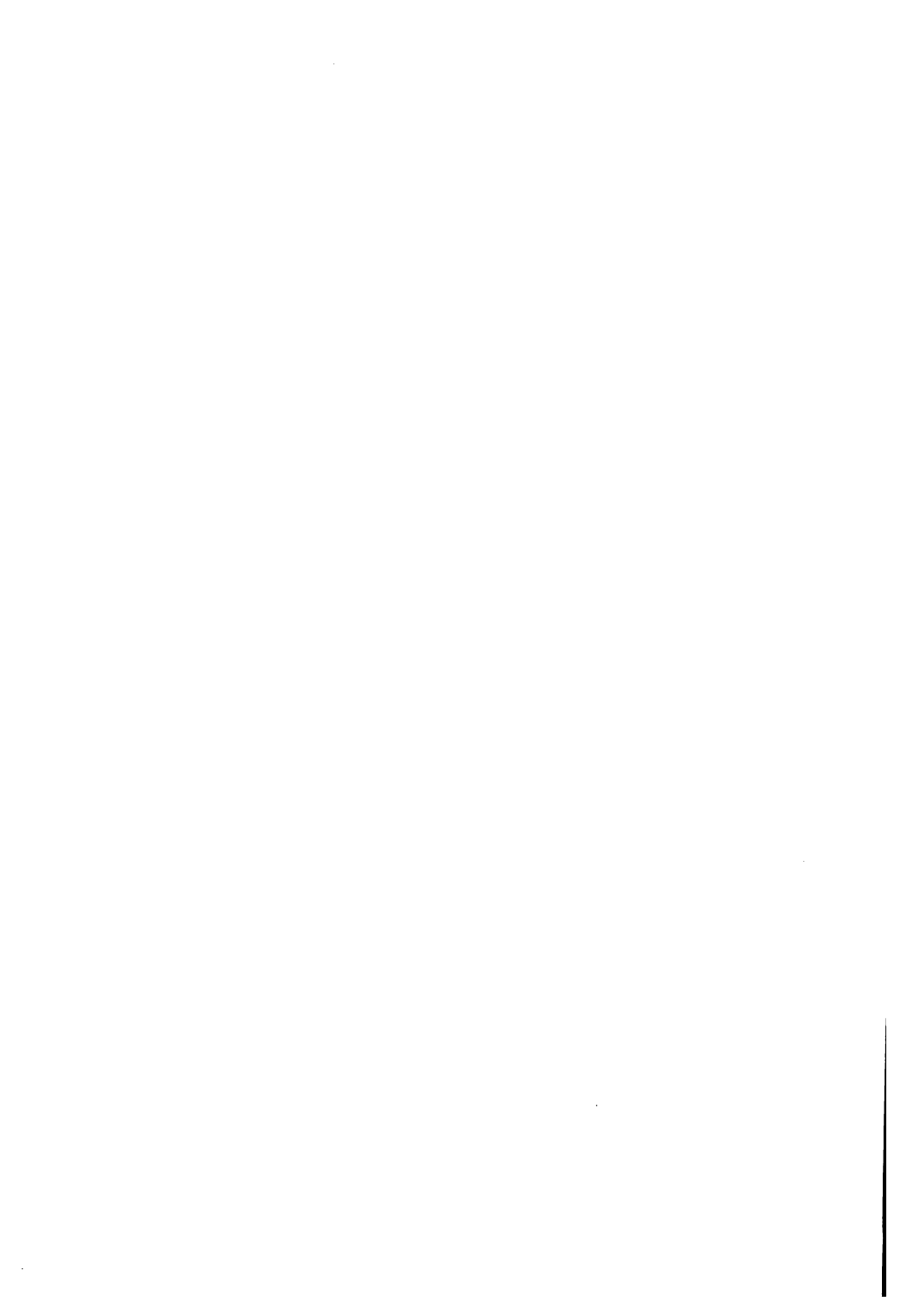
34 Internal breakdown of 'Tommy Atkins'

9.0 Summary

Stages in the Postharvest Handling System of Mangoes and Important Factors to Consider.

- | | | | |
|----|---------------------------------|-------------------------------------|---|
| 1. | HARVEST | (i)
(ii)
(iii)
(iv)
(v) | Stage of maturity
Harvesting method
Minimize damage
Rapid and economical
Field cooling |
| 2. | PACKING HOUSE OPERATIONS | (i)
(ii)
(iii)
(iv) | Wash
Sort
Size and Grade
Pack and package |
| 3. | TRANSPORTATION | (i)
(ii)
(iii)
(iv) | Minimize abrasion
Minimize vibration
Prevent compression
Temperature management |
| 4. | STORAGE | (i)
(ii)
(iii)
(iv) | Temperature management
Commodity compatibility
Sanitation
Postharvest treatment e.g. Semperfresh dips, storage in polyethylene bags. |
| 5. | DISEASES AND DISORDERS | Anthracnose | Preharvest control with strict spray programme as previously described.

Postharvest control with hot water or benomyl. |
| | | Stem-End Rot | Postharvest control with benomyl. |
| | | Chilling Injury | Do not store mangoes below 12°C. |
| | | Scarring | Remove scarred fruits during sorting operation. |
| | | Internal Breakdown | Cause related to calcium and potassium levels. Control not precisely known. |



FECHA DE DEVOLUCION

15 MAY 1987

IICA
PM-A2/TT-87-001

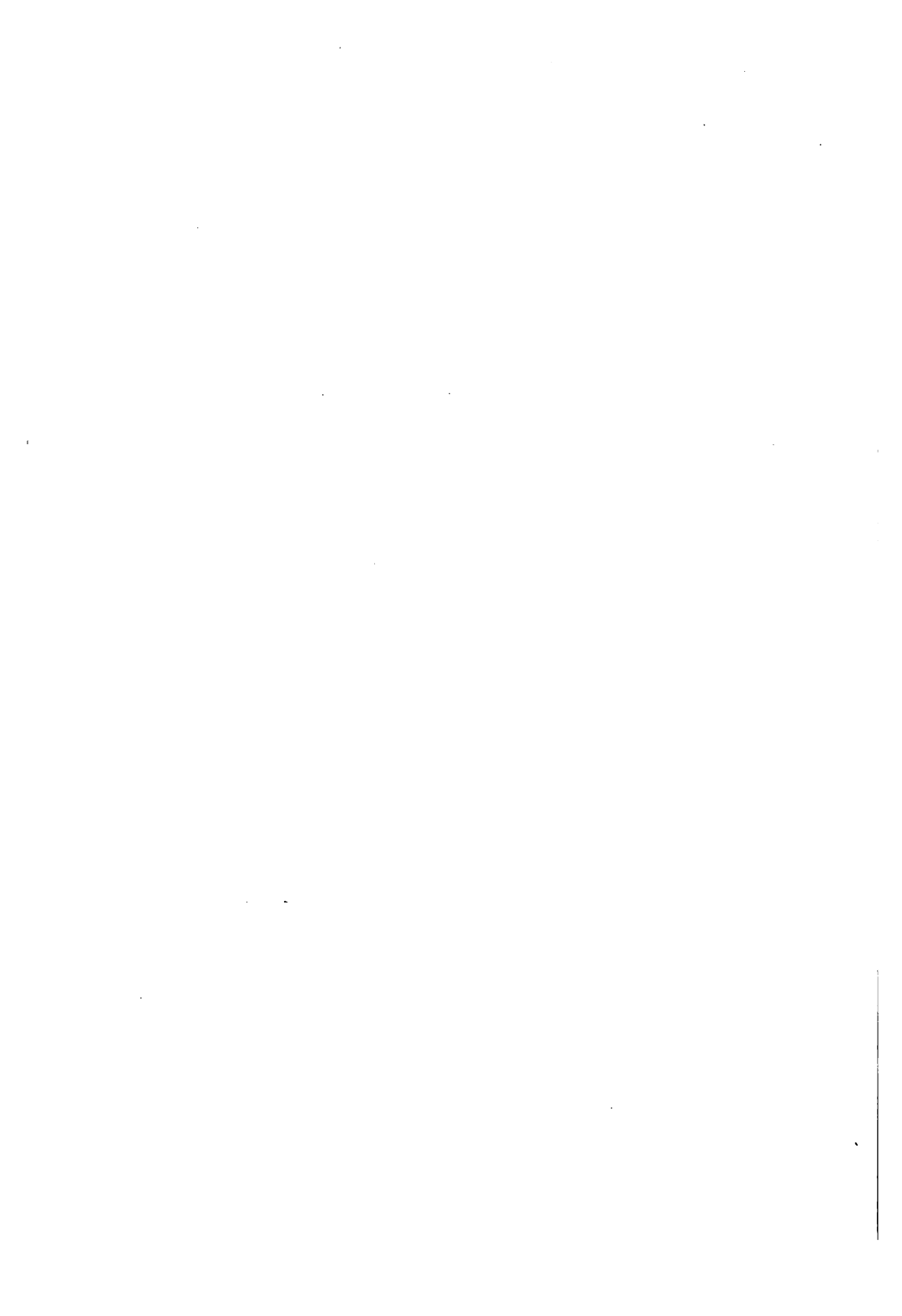
Autor

Título *A Manual of postharvest handling systems for perishable fruit crop*

Fecha Devolución

Nombre del solicitante

15 MAY 1987
Gustavo





OFFICE IN TRINIDAD AND TOBAGO