

## Postharvest losses of mango fruit (*Mangifera indica*) in Morogoro Region

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### Abstract

The study was conducted to determine mango fruit damages at the different stages of the supply chain. The goal of the study was to develop suitable practices for reduction of postharvest losses at wholesale market in Morogoro region. The total postharvest losses of mango fruits encountered in all stages along the supply chain was 43.8 % with the main damage features being caused by fruit fly maggots, microbial decay and fruit softening each accounting for 8.65, 11.85 and 20.05% of the total losses, respectively. It is recommended that during transportation, loading of too many cartons on trucks without separators be avoided. Keeping mango fruits under the sun during the whole should also be avoided.

Key words: Dodo, fruit fly, fruit softening, microbial decay, postharvest losses, supply chain

### Résumé

L'étude a été menée afin de déterminer la dégradation des mangues pendant les différents stades de la chaîne d'approvisionnement. L'objectif de l'étude était de développer des pratiques convenables en matière de réduction des pertes après récolte au marché de gros dans la région de Morogoro. Les pertes totale après récolte des mangues rencontrées à toutes les étapes le long de la chaîne d'approvisionnement étaient de 43,8% avec les caractéristiques principales de dégradation étant causées par les larves de mouches des fruits, la pourriture microbienne et le ramollissement des fruits, représentant chacun 8,65, 11,85 et 20,05% des pertes totales, respectivement. Il est recommandé que pendant le transport, le chargement de beaucoup de cartons dans les camions sans séparateurs soit évité. Garder des mangues sous le soleil pendant toute la durée doit également être évité.

Mots clés: Dodo, mouche des fruits, ramollissement des fruits, pourriture microbienne, pertes après récolte, chaîne d'approvisionnement

## Background

Mango (*Mangifera indica* L.) is among the most important fruits in Tanzania both locally and for the export market. It ranks third after citrus and pineapple (FAO, 1999). Between 1990 and 2005, mango production in Tanzania increased from 61,680 metric tons to 254 550 metric tons. The export market for mangoes is growing, especially to the Middle East countries (TFC, 2008). Although the potential for increased mango exports is high, post-harvest losses of the fruit in Tanzania is very high, estimated at 60 % (TFC, 2008). The mango fruit supply chain involves harvest, transport and storage during marketing. It is along this chain that losses are incurred. The losses of the fruit at each of these stages along with their causes are presently unknown. This study was therefore done to determine critical stages of supply chain associated with high postharvest deterioration of fresh mango fruits in Tanzania.

## Literature Summary

In Tanzania, mango is the third most important export fruit, only superseded by production was estimated at 254,550 tonnes after registering an average annual growth rate of 21 % between 1991 and 2005 (Match Marker Associates, 2008). Major export mango cultivars are Apple, Ngowe, Palma, Boribo, Haden, Keitt, Kent, Van Dyke, Alphonso, Red Indian, Tommy Atkins and Hadijar (Niyibigira *et al.*, 2004). Mango undergoes a climacteric ripening at 18–24 °C. It is preferably stored at 10 - 12 °C to obtain shelflife of 2 – 3 weeks. Above 30°C fruit ripening is delayed, and results in fruits with a strong flavour but mottled skin (Eileen and Joselito, 2001). Postharvest losses of mango fruits in Tanzania have been estimated at 60 % (TFC, 2008). Comparable losses (69 %) have been reported for Pakistan while for India, lower losses (25 – 40%) are incurred (Iqbal, 2008 and Iksan, 2008). The main causes of mango postharvest losses have been reported to be improper handling before, during and after harvesting (Medlicott, 2003). Field management such as pest control leads to minimal postharvest losses (Samson, 1986). Harvesting during cool periods of the day, picking using poles, removal of latex and field heat, fruit treatment by hot water, use of proper transportation trucks, transportation during the night and storage of fruits under the shade reduce postharvest losses (Iksan, 2000 and FAIC, 2008; Iqbal, 2008).

## Study Description

Mango cv. 'Dodo' fruits were harvested from farmers' orchards at Kibwaya village (500 fruits) and Kiholole village (4,500 fruits) on 9 – 10<sup>th</sup> February 2009. Fruits were harvested according to farmer's practices. Fruits were harvested using poles with a sleeve and ring at the top to hold the harvested fruit. A picker

had ability of carrying up to five fruits and putting them in a collection container ('tenga') on a tree from where 'tenga' were delivered down using a rope. The slight rigid 'tenga' were made of bamboo plants with perforations to allow air circulation (Yahia, 1999). 'Tenga' were cushioned by dry banana leaves and each tenga was packaged with 125 to 130 fruits. 'Tengas' with mango fruits were packed in an open body truck the way traders and farmers do. Fruits were transported from Mkuyuni ward to Morogoro Town (about 40 km) starting from 8.00 am to 10 am. On arrival to the urban market, the fruit cartons were kept on the ground under the sun for three and five days to simulate wholesaler marketing practice during peak and low seasons. During harvesting, transportation and wholesale storage and marketing stages, postharvest loss data were collected. Data were collected on number of marketable and unmarketable fruits. Unmarketable fruits were characterised by defects caused by insect, microbial decay, and bruises during handling. Excessively soft fruits were also includes among lost fruits.

### Research Application

The percentages of marketable mango fruits and associated losses along the postharvest chain are presented in Table 1. Losses increased from 2.6% to 30.6% during wholesale marketing at the 5<sup>th</sup> day. Overall, postharvest losses in mango cv. Dodo were 43.8%. This is certainly likely to increase as on-farm storage period and transport distance increase. The high fruit losses during wholesale marketing period were probably due to fruit storage under the sun which increases temperatures and fruit biochemical reactions such as respiration and ethylene biosynthesis (Panhwar, 2009). Among the features of postharvest losses, softening was the major cause of loss followed by microbial decay and fruit fly damage (Table 2).

**Table 1. Proportion of mature, ripe and damaged mango cv. 'Dodo' fruits at various stages of the supply chain in Morogoro region.**

Supply chain stage	Marketable fruits (%)	Postharvest losses (%)
Harvesting	97.4 <sup>a</sup>	2.6 <sup>c</sup>
Transportation	89.4 <sup>b</sup>	10.6 <sup>b</sup>
Wholesale at 3 <sup>rd</sup> day	84.9 <sup>c</sup>	15.1 <sup>b</sup>
Wholesale at 5 <sup>th</sup> day	69.4 <sup>d</sup>	30.6 <sup>a</sup>

Means bearing the same superscript letter within the column are not significant different ( $P < 0.05$ ) according to Tukey test.

**Table 2. Features of postharvest damage of fresh mango fruits at various stages of supply chain.**

Fruit damage feature (%)	Harvest stage	Transport stage	Wholesale stage
Mechanical injury	2.0a	1.8b	0.1e
Softening	0.0b	1.6b	15.5a
Microbial decay	0.6b	4.9a	6.7b
Fruit fly larvae	0.0b	0.3c	5.4c
Other symptoms	0.0b	2.0b	2.9d

Means bearing the same superscript letter within the column are not significant different ( $P < 0.05$ ) according to Tukey test.

### Recommendation

From this study it is recommended that transportation of mangoes be improved. Care should be taken not to load too many cartons on trucks. Even then, cartons should be loaded with separators between them. Storage conditions during whole sale should be improved. Keeping mango fruits under the sun should be discouraged.

### References

- Chaplin, G. R. 1981. Postharvest Handling of Mangoes. Tech. Bull. Dept. Prim. Australia.
- FAO. 1999. Commodity Market Review, Commodities and Trade Division, [[http:// www.fao.org/waicent/ faoinfo/ economic/ESC/escp/cmre.htm](http://www.fao.org/waicent/faoinfo/economic/ESC/escp/cmre.htm)] site visited on 24/4/2008.
- FAIC. 2008. Post Harvest Management. [[http:// www.ficciagroindia.com/post-harvest-mgmt/fruits/ Mango.htm](http://www.ficciagroindia.com/post-harvest-mgmt/fruits/Mango.htm)]. Cited on 24/04/2008.
- Iksan. 2000. Mango postharvest technology. [[http:// www.iksan.com/links/ap-mangoPost% 20harvest% 20 technology.shtm-108k-](http://www.iksan.com/links/ap-mangoPost%20harvest%20technology.shtm-108k-)]. Cited on 15/04/2008
- Iqbal, M. 2008. Post Harvest Handling of Mangoes. [[http:// www.pakissan.com/english/allabout/orchards/mango/ post.harvest.handling.of.mangoes.shtml](http://www.pakissan.com/english/allabout/orchards/mango/post.harvest.handling.of.mangoes.shtml)]. Cited on 04/06/2009.
- Medlicott, A. 2003. Postharvest Handling of Mango Queensland Government [[http://www.agribusinessonline.com/crops/ mangophh.asp](http://www.agribusinessonline.com/crops/mangophh.asp)] cited on 27/03/2008.
- Niyibigira, E.I., Lada, V.Y.and Abdullay, Z.S. 2004. Mango production and marketing in Zanzibar: potential, issues and constraints. [[http://www.actahort.org/members/show pdf?booknr=621\\_9](http://www.actahort.org/members/showpdf?booknr=621_9)]. Cited on 04/06/2008.
- Panhwar F. 2009. Postharvest technology of mango fruits, its development, Physiology, pathology and marketing in Pakistan. [[http://www.chemlin.de/publications/documents/ postharvest\\_technology\\_of\\_mango\\_fruits.htm](http://www.chemlin.de/publications/documents/postharvest_technology_of_mango_fruits.htm)]. Cited on 25/05/09.

TFC. 2008. Markets Information. [<http://ushirika.coop/content/view/20/38/1/1/>] site visited on 27/05/2008.

Samson, J.A. 1986. Tropical Fruits. Longman Group, UK. pp. 232 - 233.

Yahia, M. 1999. Postharvest handling of mango fruits. Agriculture technology utilization and transfer RONCO. Technological Report 9. [[www.narasoft.com/pdf/p85.pdf](http://www.narasoft.com/pdf/p85.pdf)]. Cited on 25/2/2020.