*Int.J.Curr.Microbiol.App.Sci* (2017) *6*(12): 310-318

*International Journal of Current Microbiology and Applied Sciences*
*ISSN: 2319-7706* **Volume 6 Number 12 (2017) pp. 310-318**
Journal homepage: http://www.ijcmas.com

**Original Research Article** https://doi.org/10.20546/ijcmas.2017.612.037

# Estimation of Post-Harvest Losses of Mangoes at Different Stages from Harvesting to Consumption

**Moula Sab[1*], M.B. Ashok[2] and S.N. Sudhakara[3]**

[1]Department of Agricultural Extension Education, UAS, Raichur, Karnataka, India
[2]KLE KVK, Belgaum, Karnataka, India
[3]UAS, GKVK, Bengaluru, Karnataka, India
**Corresponding author*

**A B S T R A C T**

The research study was carried out in Dharwad and Belgaum districts of North Karnataka during the year 2013-14. Following the simple random sampling, 120 respondents were selected from six villages of two taluks. The data was elicited through personal interview method. The important findings of the study were; majority of the respondents possessed medium level of knowledge (72.50%) and adoption (68.33%) about improved cultivation practices of mango. Almost all the mango grower had grown Alphonso and Totapuri varieties. More than half the number of mango growers had followed the recommended spacing, irrigation for young gardens and applied different chemicals for the control of the mango hopper and the powdery mildew disease. Majority (79.16%) of the respondents had followed manual harvesting by labours, cent per cent of the respondents stored the mangoes on the ground itself. Majority of the respondents (81.66%) had used truck for transportation. Only 20.00 and 15.00 per cent of the respondents followed the processing for juice and pickle making, respectively. Majority (59.17%) of the respondents belonged to the middle age group. A considerable percentage of respondents (23.33%) educated upto primary school. Further, they had medium level of management orientation, risk orientation, scientific orientation, extension contact, extension participation and mass media participation, respectively. Majority of the mango growers (64.17%) had small farms. Majority of the respondents (74.17%) possessed television sets, among them 55.83 per cent of farmers regularly viewed the news. Post-harvest losses at farm level were quantified, which accounted for about 8.44 per cent. Losses at wholesale market including transportation accounted for about 4.93 per cent. Losses at retailing market, losses at storage unit and losses at consumer level accounted for about 5.46, 3.19 and 6.82 per cent respectively. Overall post-harvest losses in mango at different stages from harvesting to consumption were quantified which accounted for about 34.49 per cent. Majority (78.00%) of the respondents expressed the problems such as lack of knowledge on the post-harvest technologies, lack of storage facilities even for few days (65.00%), problem of market transportation (62.00%) and lack of technical guidance about post-harvest technologies (46.66%).

**Keywords**

Knowledge level, Cultivation practices, Mango Varities, Farmers respond, Farmers type, Education level, Harvesting, Markets, Post-harvest losses, Storage methods.

**Article Info**

***Accepted:***
04 October 2017
***Available Online:***
10 December 2017

## Introduction

India has achieved self-sufficiency in food grain production but not in fruit production. In recent years, greater attention is being paid to horticulture, for better utilization and

development of marginal, poor and wastelands, which are hardly suitable for economic cultivation of field crops. Horticulture has great potential for growth. Among the horticultural crops, fruits occupy a major area and have very high export value. Fruit crops give maximum nutritive food per unit area. India produces 49.80 million tonnes of fruits out of the total 320 million tonnes of fruit produced in the world. Thus, it occupies the first position (2000-01). The daily per capita consumption of fruit is 40 grams as against 120 grams recommended by the Diet Advisory Committee of the Indian Council of Medical Research. It means there is a considerable gap between the gross production and net availability of fresh fruits due to lack of knowledge about new production technologies, post-harvest technologies and heavy post-harvest losses. The post-harvest losses of horticultural crops in developing countries have been reported to vary between 15 to 50 per cent (Subrahmanyam, 1986) with an estimated minimum of 20 per cent. Therefore, immediate efforts are required to increase the production of fruits to meet the target fixed by the National Commission on Agriculture that is 45 million tonnes. It can be achieved only if concerted efforts are made to increase the area, production and productivity of fruits and to reduce the post-harvest losses.

Among the fruits mangoes, grapes and walnuts are exported in large quantities to other countries. Among the processed fruits, mango pulp is exported in large quantities. In the processing sector, there are little over 450 registered units under Fruit Product Order (FPO). Low productivity resulting in higher costs and failure to meet the stringent quality requirements of international markets are often cited as the cause for poor performance. Among the fresh fruits Alphanso mango variety is exported to other countries, but the problem of spongy tissue disease is a negative point. So, the scientists have released many hybrids and high yielding varieties to improve the export potential. Mango (*Mangifera indica* L.) is eulogized as the king of fruits. It belongs to the dicotyledonous family *Anacardiaceae*. It is believed that the fruit originated from India and its cultivation has been traced back to more than 6000 years in the past. Groves and gardens of mango find mention in descriptions in the epics *Ramayana* and *Mahabharata* also. Mango is grown in all tropical countries (NHB Yearbook, 2000). Mango fruits are greatly relished for their succulence, pleasant flavour and delicious taste. They are also a rich source of Beta-carotene, the precursor of vitamin-A, which is essential for the prevention of night blindness in human beings and rich source of vitamin-C also. In India, mango is one of the sacred fruits and finds place on religious ceremonies.

Horticultural crops not only provide nutritional and healthy foods, but also generate cash income to growers. Besides their economic importance, fruits play a pivotal role in human diet. There are about 30 to 40 fruit crops under cultivation in India, the major ones being Mango, Banana, Grapes, Citrus, Guava, Papaya, Pomegranate, Pineapple, Sapota and Ber. Time and money are required to cultivate food products, and unless the farmer is providing food only for his own household, he automatically becomes part of the market economy: he must sell his produce, must recover his costs, and must make a profit.

Horticultural crops differ from the other field crops like cereals and pulses with respect to certain natural characteristics like moisture content (70 to 95% as against 10 to 12% in the case of cereals), texture (soft as against hard texture in the case of cereals and pulses), unit size (5g to 5 kg as against less than 1 g in the case of cereals and pulses), etc. These

characteristics make them highly perishable resulting in huge post-harvest losses. Besides, these perishable characteristics of the horticultural produce, inadequate arrangements for post-harvest management like storage, processing, preservation and marketing facilities lead to problem of post-harvest losses (Mitrannavar, 2012). Keeping the above facts in mind the present study was conducted with an objective to know the post-harvest losses in mango in Karnataka.

## Materials and Methods

The present study was carried out in Dharwad and Belgaum districts of North Karnataka during the year 2013-14. One taluk was selected from each district based on highest area under mango in the district. Hence 2 taluks were selected from the districts. From each taluk 6 villages were selected for the study making total villages of 12. List of farmers growing mango was prepared for each of the selected village in consultation with the Horticulture Department and from each village ten respondents (farmers who were growing mango) were drawn using simple random sampling technique, *i.e.* sixty respondents were selected from each taluka, and thus total of 120 respondents were selected. The data was collected from the respondents personally using structured interview schedule. The collected data were analyzed using appropriate statistical tools.

## Post-harvest looses at farm level

In Dharwad and Belgaum taluks most of mango growing farmers follow manual harvesting, where labourers harvest the fruits using bamboo wooden stick with hook at the end with which the fruits are pulled down from the tree (Fig. 1a). Some labourers shake the branches during the harvesting. After harvesting the entire orchard, the fruits are collected (Fig. 1b) with the help of baskets and heaped (Fig. 2a) temporarily in a common place. At the time of harvesting, the damaged, over ripened and spoiled fruits are discarded (Fig. 2b). Losses during this stage were quantified and were based on the damages sustained at the time of harvesting. It was observed that in case a total quantity of Alphonso out of 37000 quintal harvested in the samples, about 3120 quintal were lost, which accounted for about 8.44 per cent due to various reasons (Table 1).

Nanda *et al.,* (2010) reported an overall total post-harvest loss of 12.74% in mango. The highest loss (10.64%) was found in farm operations like harvesting (4.11%), sorting & grading (2.80%) and transportation (2.53%). Murthy *et al.,* (2002) assessed the post-harvest losses in Banganapalli mango at different stages of marketing in Andhra Pradesh. The average post-harvest loss at the farm level was 15.6%.

## Post-harvest losses at wholesale market including transportation

After harvesting, most of the farmers transport the fruits to the markets in lorries and tractors. Sometimes while loading in trucks the fruits are directly dumped into lorry without any packing (Fig. 3a). At the time of unloading the fruits in the wholesale market, the damaged, over ripened, immature and unmarketable size fruits are separated out. Losses in the wholesale market including transportation were quantified in both Dharwad and Belgaum wholesale markets. The total quantity transported was 3,385 quintal, out of which 166.90 quintal (4.93%) was the loss (Table 2). The major loss of 42.30 quintal (1.25%) was due to mechanical damage, followed by over ripening, 36.20 quintal (1.07%) and spoilage 26.15 quintal (0.77%), immature and unmarketable sized fruits were 62.25 quintal accounting to 1.84 per cent.

**Table.1** Post-harvest losses at farm level

(n=120)

| | Quantity (q) | Per cent loss |
|---|---|---|
| **Quantity harvested** | **37,000** | **-** |
| **Losses due to** | | |
| Harvesting injury | 68.76 | 1.85 |
| Immature | 59.64 | 1.61 |
| Over ripe | 48.62 | 1.31 |
| Rain hail stone | 36.27 | 0.98 |
| Handling | 26.18 | 0.70 |
| Sorting | 19.56 | 0.52 |
| Cracks | 12.64 | 0.34 |
| Insect and disease attack | 11.96 | 0.32 |
| Rotting | 10.50 | 0.28 |
| Bird damage | 9.71 | 0.26 |
| Other | 8.74 | 0.23 |
| **Total post-harvest losses** | **312.58** | **8.44** |

**Table.2** Post-harvest losses at wholesale market including transportation

(n=10)

| | Quantity (q) | Per cent loss |
|---|---|---|
| **Quantity purchased** | **3,385** | **-** |
| **Losses due to** | | |
| Immature and unmarketable size | 62.25 | 1.84 |
| Mechanical damage or breakage (loading/unloading) | 42.30 | 1.25 |
| Over ripening | 36.20 | 1.07 |
| Spoilage due to disease | 26.15 | 0.77 |
| **Total** | **166.90** | **4.93** |

**Table.3** Post-harvest losses during storage

(n=10)

| | Quantity (q) | Per cent loss |
|---|---|---|
| **Quantity stored** | 1,585 | - |
| **Losses due to** | | |
| Over ripening and shriveling | 38.40 | 2.42 |
| Spoilage due to disease and physical damage | 26.60 | 1.67 |
| Variation in temperature and bedding material | 24.60 | 1.55 |
| **Total** | **89.60** | **5.65** |

**Table.4** Post-harvest losses at retailer level

(n=10)

| | Quantity (q) | Per cent loss |
|---|---|---|
| **Quantity purchased** | **59.50** | **-** |
| **Losses due to** | | |
| Mechanical damage/breakage | 1.54 | 2.58 |
| Over ripening and shriveling | 1.24 | 2.08 |
| Immature and unmarketable size | 0.47 | 0.78 |
| **Total** | **325** | **5.46** |

**Table.5** Post-harvest losses at processing units

(n=2)

| | Quantity (MT) | Per cent loss |
|---|---|---|
| **Quantity handled** | **250** | **-** |
| **Losses due to** | | |
| Immature | 3.10 | 1.24 |
| Over ripening | 2.96 | 1.18 |
| Cutting | 0.85 | 0.34 |
| Pulp extraction | 0.79 | 0.31 |
| Fruit washing | 0.30 | 1.24 |
| **Total post-harvest losses** | **8.00** | **3.19** |

**Table.6** Post-harvest losses at the consumer level

(n=10)

| | Quantity (kg) | Per cent loss |
|---|---|---|
| **Quantity purchased** | **70** | **-** |
| **Losses due to** | | |
| Others (Physical injury) | 2.5 | 3.28 |
| Spoilage due to disease | 1.5 | 1.97 |
| Over ripening and shriveling | 1.2 | 1.57 |
| **Total** | **5.2** | **6.28** |

**Table.7** Overall post-harvest losses in mango

| ***Sl. No.*** | ***Stages*** | ***Quantity (tonnes)*** | **Losses (tonnes)** | **Losses (%)** |
|---|---|---|---|---|
| 1. | Farm level | 370.00 | 31.20 | 8.44 |
| 2. | Wholesale market including transportation | 338.50 | 16.69 | 4.93 |
| 3. | Retailing market | 5.95 | 0.32 | 5.46 |
| 4. | Storage unit | 158.50 | 89.60 | 5.65 |
| 5. | Processing unit | 2,50,000 | 8000 | 3.19 |
| 6. | Consumers | 0.070 | 0.052 | 6.82 |
| | **Total post-harvest losses** | | | **34.49** |

**Fig.1a** Harvesting operation in Mango in Dharwad taluk

**Fig.1b** Collection of fruits after harvesting

**Fig.2a** Temporary heaping of fruits in the orchard

**Fig.2b** At the time of harvesting the damaged, over ripened and spoiled fruits due to birds and harvesting injury

**Fig.3a** At the time of loading and unloading in the whole sale market the fruits are directly dumped into lorry without any packing

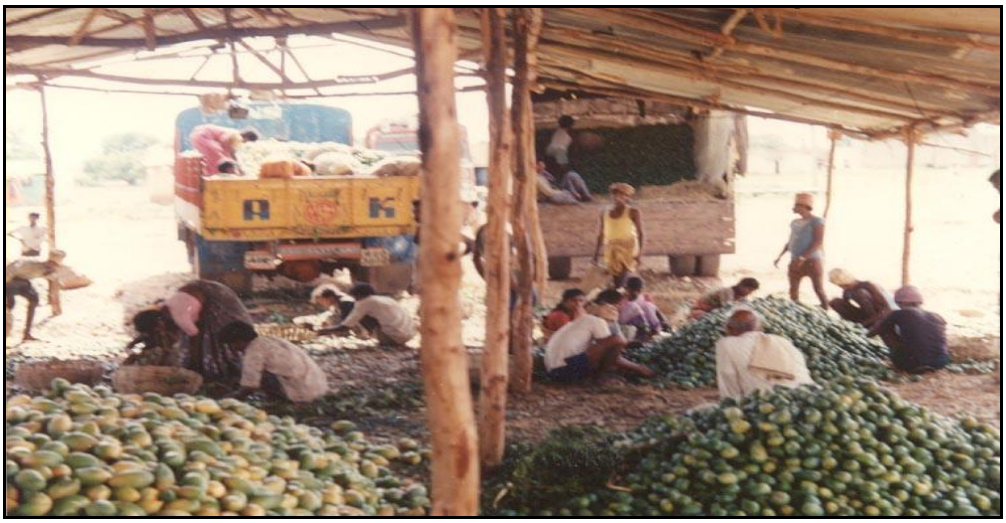
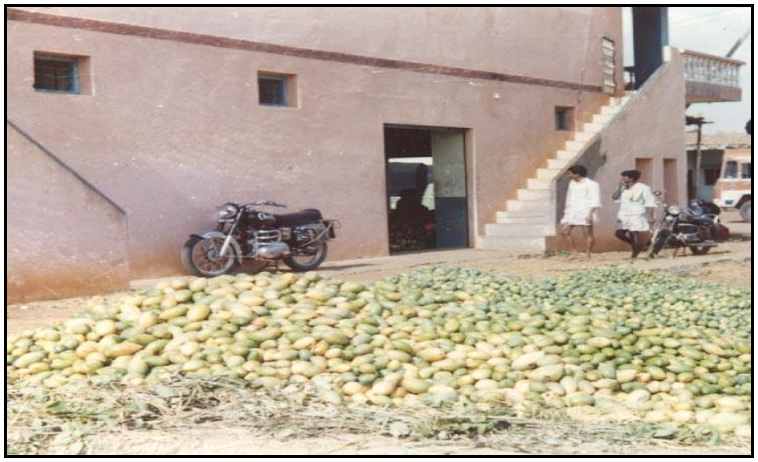


**Fig.3b** Method of storage



## Post-harvest losses during storage

The fruits are stored in the market yard or sometimes in rooms, when fruits are arranged in several layers on the ground spread with paddy straw and the top of the lot is also covered with straw. Fruits are kept for about four weeks for uniform ripening. Then the fruits are distributed to retailers. Retailers purchase the fruits directly from the wholesale agent. They classify the fruits into different sizes and sell within two or three days (Fig. 3b).

The data collected on storage losses in alphonso variety is presented in Table 3. For a sampled quantity of 1585.00 quintal stored, 89.60 quintal fruits were lost amounting to 5.65 per cent of fruits loss.

The major loss was due to spoilage which contributed to a loss of about 38.40 quintal (2.42%). The loss due to over ripening and shrivelling was about 26.60 q (1.67%). Murthy *et al.*, (2002) assessed the post-harvest losses in Banganapalli mango at different stages of marketing in Andhra

Pradesh and reported that post-harvest losses during storage and ripening were estimated as 8.80 %.

## Post-harvest losses at the retail level

When data was collected at the retail level, it was found that the losses were about 5.46 per cent i.e., out of 59.50 quintal sampled nearly about 325 kg were wasted (Table 4). The major loss was due to spoilage accounting to about 2.58 per cent. The loss due to over ripening and shrivelling was about 2.08 per cent and pilferage accounted for 0.78 per cent.

The results are in line with the results obtained by Murthy *et al.,* (2002) who reported that the loss at the retail marketing was found to be 5.25 per cent. Sreenivasa Murthy *et al.,* (2002) reported a physical post-harvest loss of 5.25 per cent at the retail level.

## Post-harvest losses at processing units

The post-harvest losses of mango fruits during processing units were estimated and the details are given in Table 5. The total quantity of fruit handled was 250 million tonnes from two processing units, out of which 8 million tonnes was lost. The major loss was due to over ripening and immature (1.18% and 1.24%, respectively) followed by cutting and pulp extraction (0.34% and 0.31%, respectively).

## Post-harvest losses at consumer level

The data was collected at the consumer level, reveals that the losses were about 6.28 per cent i.e., out of 70 kg sampled nearly about 5.2 kg were wasted (Table 6). The major loss was due to physical injury including cutting accounted to 3.28 per cent. The loss due to over ripening and shrivelling was about 1.57 per cent and spoilage due to disease accounted for 1.97 per cent.

## Overall post-harvest losses

Six important stages were identified in the post-harvest handling chain and losses were estimated at each stage (Table 7). The stages were at farm level, transporting and marketing, storage, retail, processing unit and consumer level. The overall loss accounted was 34.49 per cent (8.44 % at field level, 4.93 % wholesale market, 5.46 % in retailing market, 5.65 % in storage unit, 3.19 % in processing unit and 6.82 % in consumers level). The studies conducted by Srinivas *et al.,* (1997) and Murthy *et al.,* (2002) reported that, the total post-harvest loss in mango was found to 17.90 and 29.65 per cent respectively.

It is clear from the results of the study that, post-harvest losses in mango at different levels was found to 8.44 per cent at farm level, 4.93 per cent at market level, 5.65 per cent at during storage, 5.46 per cent at retailer level, 3.19 per cent at processing unit and 6.28 per cent at consumer level accounting for total loss of 34.49 per cent. Hence it can be concluded for the study that, there is a need to provide better infrastructural facilities like better transportation, marketing and cold storage facilities in order to avoid the post-harvest losses at different levels. There is a need to create awareness among the farmers regarding measures to control the post-harvest losses of mango at different levels through intensive extension educational activities. Administrators, policy makers and other stakeholders should provide suitable facilities for avoiding post-harvest losses in mango.

## References

Mitrannavar, D. H., 2012. Estimation of post-harvest losses of major fruits and vegetables in Karnataka – A management appraisal. *Ph.D. (Agri.) Thesis,* University of Agricultural

Sciences, Dharwad (Karnataka).

Murthy, S.D., Gajanana, T. M., Sudha, M and Subramanyam, K.V. 2002. Post-harvest loss estimation in mangoes at different stages of marketing-A methodological perspective. Agricultural Economics Research Review, 15(2):188-200.

Nanda, S. K., Vishwakarma, R. K., Bathla, H.V.L., Anil Rai, and Chandra, P. 2010. Harvest and Post-Harvest Losses of major crops and livestock produce in India. All India Coordinated Research Project on Post-Harvest Technology (ICAR), Ludhiana.

Sreenivasa Murthy, D., Gajanana, T. M., Sudha, M. and Subramanyam, K. V., 2002. Postharvest loss estimation in mango at different stages of marketing-A methodological perspective. *Agril. Econ. Res. Rev.*, 15 (2): 188-200.

Srinivas, R. N., Venkatesh Reddy, T., Ravi, P. C., Lalith Achoth and Chinnappa Reddy, B. V., 1997. Post-harvest loss assessment of Totapuri and Alphonso mangoes. *J. Food Sci. Technol.*, 34: 70-72.

**How to cite this article:**

Moula Sab, M.B. Ashok and Sudhakara, S.N. 2017. Estimation of Post-Harvest Losses of Mangoes at Different Stages from Harvesting to Consumption. *Int.J.Curr.Microbiol.App.Sci.* 6(12): 310-318. doi: https://doi.org/10.20546/ijcmas.2017.612.037