

Mango Wastage and Farm Level Threats to the Mango Growers in Malihabad Tehsil of District Lucknow, India

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Abstract:

Mango is a very delicate fruit and get damaged easily both in unripe and ripe conditions during plucking from trees. As unripe fruits most of the cases get damaged from inside and at the time of ripening these inside damaged fruits get rotten and become uneconomic and causes huge losses predominantly, to the mango growers, sellers and buyers as well. It is important to take due care in mango harvesting, its timing of plucking, transportation and storage to avoid such damages and wastage of mango. Due to lack of awareness, inadequate and competent facilities of mango plucking, grading, storage and transportation; huge amount of mango fruits get destroyed and damaged every year in Malihabad. Mango growers, itself do enormous damages to the mango fruits at the time of fruits harvesting in the mango orchards. The study results that on an average 7.45 kg/quintal of mango gets damaged and become uneconomic at the time of plucking in the orchards in Malihabad, storms, loo, hails, heavy rain, and various biological agents are also major threats to unripe and ripe mango fruits at farm level. And rest of the damage done at the time of storage, processing and transportation. In this way about 25-40% of total mango produced get damaged and destroyed at various stages of supply chain. If these damages can be reduced anyhow; it will surely insure more money to the mango growers and sellers as well. Present paper mainly focuses on the wastages and damages to the mango fruits at farm level and further processes adopted by the mango growers in Malihabad and provide suggestions to avoid these losses.

Index Terms: biological agents, farm level threats, mango wastage, supply chain, uneconomic.

I. INTRODUCTION:

India is the largest producer of mango in the world. Production of mango diversified all around the world but major concentration is in the Asian continent and more precisely in India and neighboring countries like Pakistan, Bangladesh and Myanmar. India produces an average of 15 million t (MT) of mango in a year (Mitra, 2016). India is also second largest producer of overall fruits, but is wasting around one third of the fruits output due to various reasons. Wastage is reported in all stages of supply chain such as post harvest processes, farm gate, transportation, and cold storage, processing, trading and retailing (Arivazhagan et al., 2016).

Mango is a long lived plant and starts bearing fruits at the age of 4-5 years after plantation, but commercial mango production starts after the age of 10 years. About 25-40 per cent of produced mango gets destroyed before reaching to the consumers in the way from orchard to market. Thus, it is important to take appropriate measures in harvesting, grading, packaging, storage, and transportation, so that fruit damages must be reduced (Yadav, 2017).

Mango is a highly perishable fruit, ripens fast during summer and becomes inconsumable very soon after ripening. As per an estimate about 30-35% of mango is lost in harvest and post-harvest phase (Rosalin and Vinayagamorthy, 2014). The method of harvesting in mango is done mainly by hand picking, by climbing on the trees, with a notched stick having a pouch (*khwanchara*), and directly by stick. Few big mango growers also use specially designed mango harvesters in Malihabad. Accidental falling of fruits on the earth, results in bruising and cracking of fruits and losses are estimated to a maximum of 15 % in mango (Gopalakrishnan, 2013).

Time of mango plucking decides fruits durability and important aspect of commercial mango harvesting. Proper packing and storage at farm level is also an important activity for commercial soundness of mango fruits and important for higher durability. The fruits treated with 4 percent wax-emulsion can be kept at room temperature for 12 days and 35 days in cold storage (37 °F +_1 and 85-90 per cent relative humidity) after packing in perforated polythene bags. Fully matured, but still hard fruit of *dashehari* and *langra*, mango can be successfully stored for 35 and 45 days respectively at 7 °C and 9 °C temperature and relative humidity of 85-90 percent in 2-3 layers in cardboard boxes of size of 45x25x25 cm of five ply (Bal, 2012). If proper care is taken from harvesting to the final marketing to the consumers, considerable amount of mango wastage can be reduced and better quality fruits can reach to the consumer which can help the mango growers to get more commercial benefits and prices.

II. STUDY REGION:

Malihabad is a tehsil of district Lucknow has its extent in 26° 52' 11" North to 27° 6' 40" North latitudes and in 80° 33' 40" East to 80° 50' 57" East longitudes. Whole study area is spread in about 478.01 sq km. According to the census of 2011,

Malihabad has 368453 persons in which, 193230 are males and 175223 are females (Census 2011 and Sankhiki Patrika, 2013-14) (Fig.1).

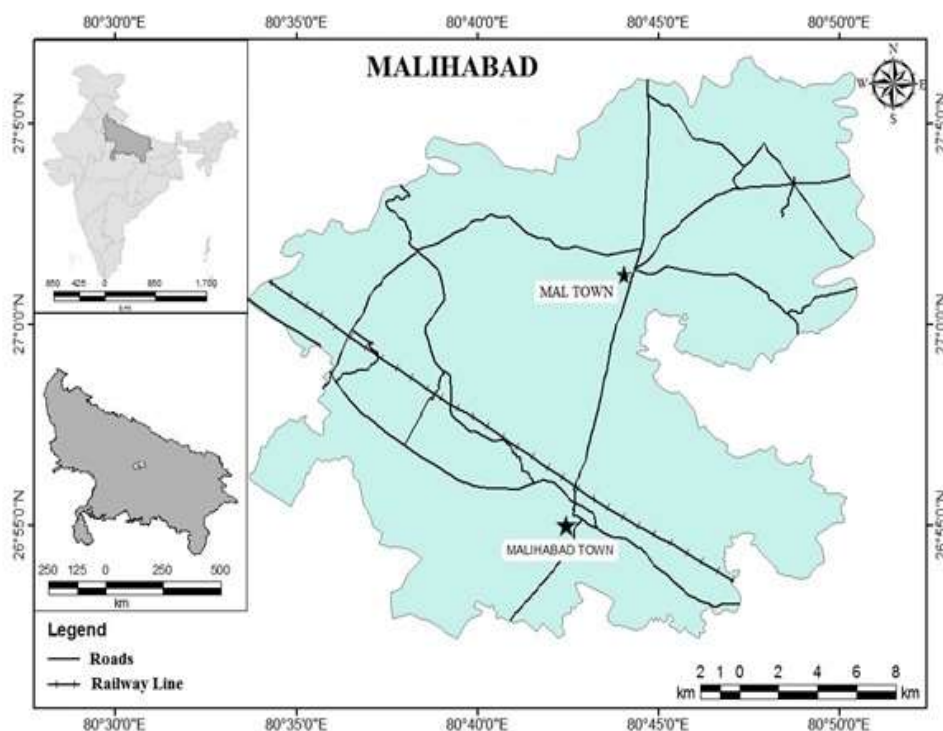


Fig. 1: Location map of the study area

III. OBJECTIVES:

Main objectives of the study are to study the mango harvesting practices in Malihabad. Study analyzes the farm level wastage and damages of mango fruits i.e. at the time of plucking from trees and major natural and biological threats to mango at farm level. Study also envisage the available packing, storage and other facilities essential to efficient mango harvesting and make suggestions to reduce the farm level losses of mango to increase economic profits to the mango growers.

IV. METHODOLOGY:

The present paper traces its base on, both primarily on secondary data. Primary data have been gathered through 475 selected respondents with the help of questionnaires, observations and various field visits. All the respondents are mango growers purposively. Secondary data have been collected from census, Sankhiki Patrika etc. Further conclusions have been drawn with the help of acquired data and suggestions have been made accordingly.

V. RESULT AND DISCUSSIONS:

Best crop management, harvesting and mango picking techniques are as important as the irrigation, manuring and protection of plants, as efficient crop management reduces damage of fruits and their wastage at farm level and result in increased income of the mango growers. Various methods of fruit plucking are traditionally prevalent in the Malihabad; in which plucking by hands, climbing on trees, plucking by rod/sticks and by traditional mango pluckers (*khwancha*) are common. Among the 475 respondents (mango growers) 113 (23.79 per cent) respondents pluck mango fruits by only rod/stick, 61 (12.84 per cent) by traditional mango pluckers (*khwancha*), whereas 301 (63.37 percent) by both, i.e. by rod and traditional mango plucker (Table 1 & Fig. 2). No, any sample mango grower uses modern mango plucker developed by Central Institute of Sub-tropical Horticulture (CISH).

Sl. No.	Mode of Mango Plucking	No. of Sample Respondents	Percentage
1.	Only By Rod/stick	113	23.79

2.	Only By Traditional Mango Plucker	61	12.84
3.	By Both	301	63.37
4.	By Engineered Mango Plucker	0	0.00
Total		475	100.00

Source: Field Survey, 2014.

Table 1: Mode of mango plucking by sample mango growers

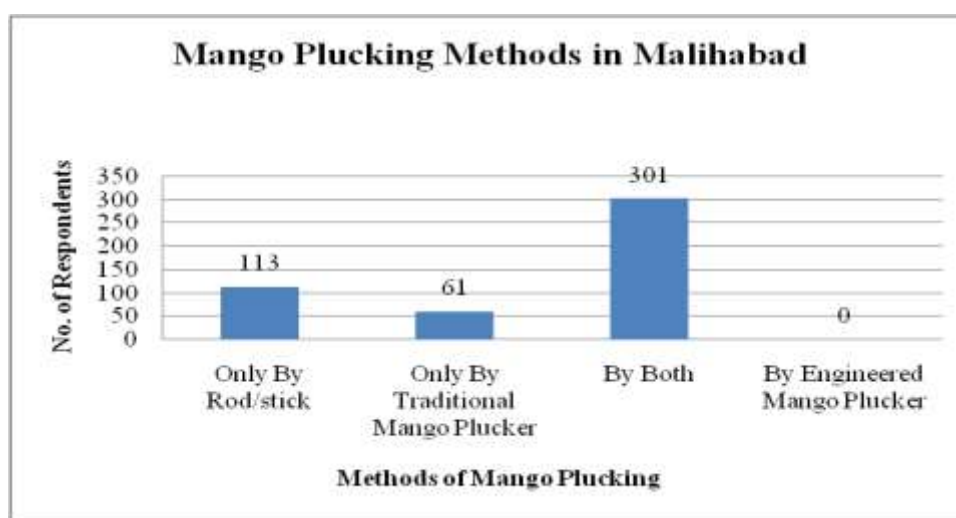


Fig. 2: Mode of mango plucking by sample mango growers

Duration of mango plucking is also significant as mango fruits plucked in the early morning and in evening remains fresh as compared to fruits plucked in the hot conditions of the afternoon. Timing of fruit plucking is mainly, decided by the mode of transportation, accessibility and by the nearness of the market from the mango orchards and choice of the mango orchardists.

Out of the 475 mango growers, 438 (92.21 per cent) accepted that they pluck mango mostly in the morning and 37 (7.79 per cent) in the evening (Table 2). The main reason behind this is not due to reasons discussed earlier, but due to the hot summer conditions prevalent in the afternoon throughout the study region. Generally, orchard owners pluck fruits throughout the day packed them and carry to the market in the next morning for sale.

Sl. No.	Time of Plucking	No. of Sample Respondents	Percentage
1.	Morning	438	92.21
2.	Afternoon	0	0.00
3.	Evening	37	7.79
Total		475	100.00

Source: Field Survey, 2014.

Table 2: Time of mango plucking by sample mango growers

Table 3 and Fig. 3 shows the wastage of mango fruits during plucking from trees, as a large amount of fruits get destroyed at the time of plucking and loose its commercial value totally. Out of the 475 sample mango growers, 195 (41.05 per cent) replied that 5-6 kg fruits get destroyed per quintal at the time of plucking, whereas 98 (20.63 per cent) noticed 7-8 kg of fruits destroy, on the other hand 182 (38.32 per cent) sample orchardists accepted that they lose 9-10 kg of fruits per quintal at the time of plucking.

Sl. No.	Wastage (in kg/quintal)	No. of Sample Respondents	Percentage
1.	5-6	195	41.05
2.	7-8	98	20.63
3.	9-10	182	38.32
	Total	475	100.00
Calculated Mean		7.45	

Source: Field Survey, 2014.

Table 3: Wastage of mango during harvesting by sample mango growers

The calculations show that on an average 7.45 kg fruit per quintal get destroyed and loose its commercial value at the time of plucking. It's a large amount and reduces the commercial gains by the mango growers with a reduction in overall income in substantial amount.

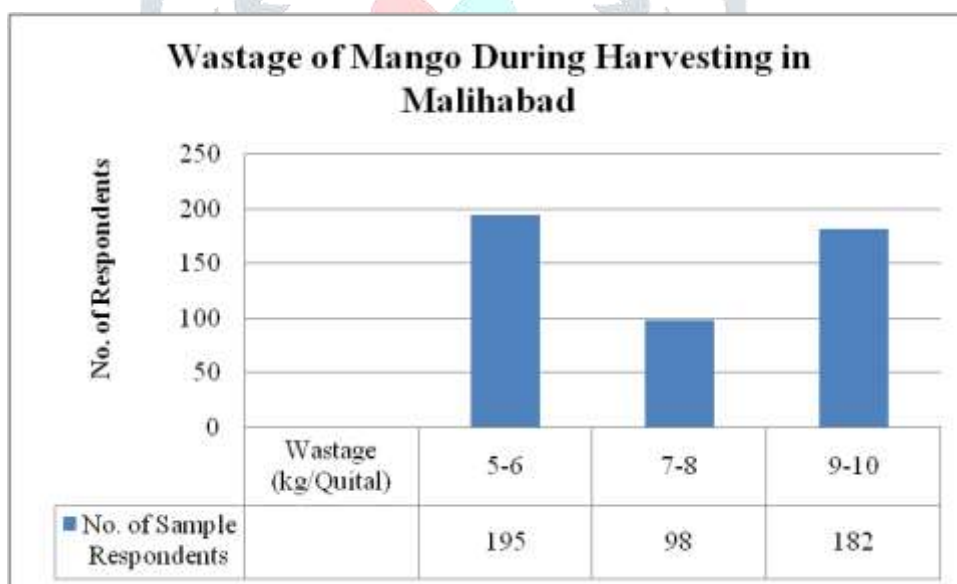


Fig. 3: Wastage of mango during harvesting in Malihabad

Grading and Packing:

Grading is an important activity from a commercial view point as fruits of different grades may fetch much more returns as compared to the ungraded fruits. Grading also help in proper ripening of fruits as bigger fruits, ripe late and can be stored 2-3 days more than smaller ones. Grading is mainly based on the size, colour and maturity of the fruits. Immature, overripe, damaged and diseased fruits should be discarded in the process of grading. Proper grading is must for gaining commercial benefits and also helpful to the producer, trader and consumers at various levels.

Generally, grading is done each and every stage, i.e. at the time of harvesting, immediately after harvesting, at the time of packing, at the time of repacking and at the point of sale, but traditional methods i.e. harvesters / orchardist's knowledge and awareness are the only source of grading. Mechanized grading is done only of those mango fruits, which are to be exported outside the country in mango pack house and limited only to the phenomenal orchardists and exporters.

Packing is very important in the sense of proper transportation, distribution and the storage of mango fruits for a long time. Earlier, mango fruits were packed in baskets of different sizes; made of bamboo or *arhar* sticks and in wooden boxes of fixed size, but there are huge regional variations in the size of such packing materials.

Recently, plastic crates and cardboard boxes are gaining pace and replacing wooden boxes due to more durability and safety of the fruits. Wooden and cardboard boxes are used for packaging and transportation of mango fruits of, having capacity of 5 to 10 kg of fruit in general. But plastic crates are of heavier size. The most commonly used containers are properly ventilated too. Old newspapers and sometimes tissue papers used for wrapping mango fruits and as lining material, it helps fruits to keep safe and stay away from inter friction and friction of hard baskets and wooden boxes, so they can reach to the market safely and can generate more profit.

For proper and safely carrying of mango it is necessary to pack them in appropriate packing boxes. These boxes may be made up of wood, plastic, cardboard/paper and baskets used, usually made up of bamboo or *arhar* stems/sticks. Out of the 475 mango growers, most of them use all above discussed packing boxes according to the need and distance of the market. Further differences are also prevalent as, only 64 (13.47 per cent) respondents among 475 mango growers use only wooden boxes as packing material, whereas the 90 (18.95 per cent) uses only plastic boxes, a very less as 40 (8.42 per cent) use only paper boxes to pack the fruits. Out of the 475 mango growers 202 (42.53 per cent) use both wooden and plastic boxes, whereas only 79 (16.63 per cent) use all three types of boxes to pack the fruits (Table 4 & Fig. 4).

Sl. No.	Packing Material	No. of Sample Respondents	Percentage
1.	Only Wooden Box	64	13.47
2.	Only Plastic Box	90	18.95
3.	Only Cardboard/Paper Box	40	8.42
4.	Wooden and Plastic Box	202	42.53
5.	Wooden, Plastic and Cardboard Box	79	16.63
Total		475	100.00

Source: Field Survey, 2014.

Table 4: Type of packing materials used by sample mango growers

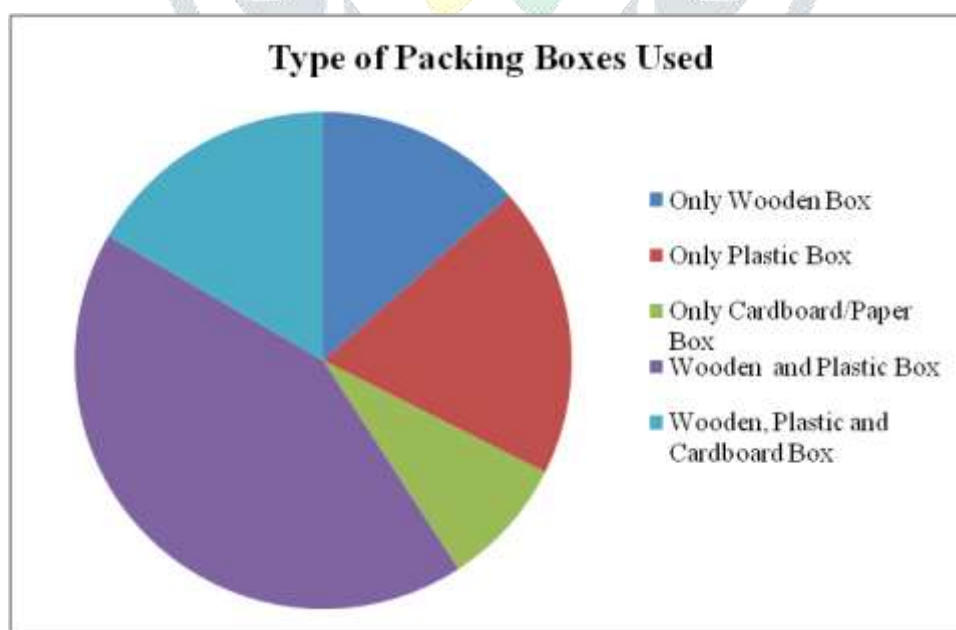


Fig. 4: Type of mango packing boxes used

Storage:

Mango is a very perishable fruit and get damaged and rotten very early so that it is important to store them properly so that they can be used for a long duration of time. Storage also helps in regulating market prices and keeps a balance between demand and supply. The mature green mango fruits can be stored at room temperature for about 4-10 days depending upon the variety; storage at optimum low temperature is very effective in increasing the storage life of mango fruits. Wax emulsion treatment is also effective measure in keeping mango, fresh for longer duration. But such advanced facilities are limited only to big exporters and are very rare in practice.

In the region mango growers seldom store the product for a long time, as they immediately pack them for sale without much waiting to dry the mango sap, but few farmers wait for drying of mango sap and pack mango in boxes after proper drying of sap. Before packing, harvested mango are collected in heaps on locally available natural materials as mango leaves, various kinds of grasses, stems of wheat, and on old newspapers etc. There, no specialized storage facilities are available to store mango fruits and they generally store fruits in *kachhi kotharies*, open *verandah* or below *chappars* or in rooms, etc. Lack of proper storage facilities prove much disastrous to mango and a huge amount of fruits get damaged and rotten and loose its economic value.

Transportation and Marketing:

Road transportation, mainly trucks, tractors and small goods carriers are the most popular medium of transport due to easy approach from the orchards to the market. Whole systems of mango fruits' marketing are mainly controlled by intermediaries, like wholesalers, retailers and commission agents exceptionally, producer sold their fruits themselves

Proper transportation medium and mechanized vehicles developed for fruits transportation for long distance are unavailable in Malihabad region, so that there are greater chances of damages of fruits while transporting. In the absence of such efficient transportation facilities a huge amount of fruits gets damaged and become uneconomic, on the other side wholesalers, retailers and commission agents obtain a huge part of money and fewer shares reach to the mango orchardists.

Other Natural and Biological Threats:

Besides above discussed heads various farm level threats are also concerned with mango fruits both in unripe and ripe stages. Mango cancer, black tip disease of mango, and various fungal diseases make mango fruits incompatible for commercial use. Frequent windstorms, loo, heavy rain, hails are also the enemy of mango fruits both unripe and ripe. Sometime by the windstorms 30-40% of mango crop get damaged and become uneconomic thus, the negative impacts of these windstorms are enormous on mango growers. Squirrels, bats, crow, and parrots prove menace to ripe fruits by cutting them. These cut and damaged fruits have no commercial value at all.

VI. CONCLUSIONS AND RECOMMENDATIONS:

Mango is a highly perishable fruit, so need due care; harvesting should be done when fruits attain full greenery and maturity but unripe. *Dashehari* generally get matured in 12 weeks, but some varieties attain maturity much early or too late. Immature fruits do not ripen properly, lack taste, flavour, colour and also heavily prone to various diseases, destroyed early while mature fruit ripe properly and can be stored for a long duration. At harvesting time the fruit should not fall on the earth as they get injured and rot early. Damages of mango at farm level are high. The reasons may be human, natural and biological. From the results and discussions it is clear that on an average 7.45 kg of mango fruits per quintal get destroyed and loose its commercial value at the time of plucking from trees in orchards. If damages by the humans at the time of plucking and biological agents added then it can be concluded that about 15-20% mango fruits damaged at farm level.

Natural causes like windstorms, hails, rain etc. are unavoidable but human and biological factors may be avoided and reduced to a large extent. These loses should be minimized as possible by practicing good mango plucking techniques, by the use of *Khwanchaa* in place of plucking mango directly by the sticks, direct hand picking should be promoted. Promotion of mango plucker developed by Central Institute of Sub-tropical Horticulture (CISH), among mango growers is a good option. Harvesting should be done in the early morning or in the evening and fruits should keep in the shade to increase durability and freshness. Harvesting should be done at unripe and fully mature conditions of mango fruits to avoid damages as ripe mango are more delicate and prone to cracks and fractures when falling on the earth. Parrots, squirrels, crow and bats damage ripe fruits not the unripe. All such measures can minimize at farm level losses and maximize profits of the mango orchardists.

It is estimated that 25-40% mango fruits get damaged at various levels in supply chain before reaching to the consumers. Proper packing, lining, storage and efficient transportation mechanisms are much needed to reduce the post harvest losses as these all are of traditional nature and inadequate and inefficient in the study area.

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