



Postharvest Handling and Assessment of Losses of Freshly Harvested Selected Vegetables

Dr. K. V. Vala¹; Er. J.P. Rathod²

¹Assistant Professor, kvvala@aaui.in

²Sen Research Assistant, jprathod@aaui.in

College of Food Processing Technology and Bio-Energy
Anand Agricultural University, Anand-388110, Gujarat, India
E-mail: kvvala66@gmail.com

Abstract: *The immense diversity in agro-climatic condition across the country enables India to produce large amount of vegetables with current production around 71 million MT, however, per capita availability is only about 180 gram as against recommended 300 gm per capita. This is due to huge losses of vegetables after harvest per year, nearly 40% fruits and vegetables are lost. Several factors are responsible for the damages & losses of the fresh produce. One of the major problems is lack of awareness and knowledge about how to handle fresh harvested vegetables. Proper postharvest handling can reduce losses of freshly vegetables and also maintained the product quality up to final consumption. Postharvest handling and losses of tomato, brinjal, okra, and leafy vegetables were evaluated from harvest to consumer market. This study was taken to identify postharvest operations followed and assessment of losses at various post-harvest handling stages; at farmers, APMC and retailers level. A standard questionnaire was prepared for collection of data and survey.*

At farmers level losses were observed in the range of 6-10, 2-6, 1-2, and 0.5 percent in tomato, brinjal, okra and leafy vegetables respectively. While 5-10, 5-8, 3-5 and 3.5 percent losses were observed at APMC level in leafy vegetables, tomato, brinjal and okra respectively. Whereas losses in the range of 9-16, 6-10, 2-4 and 2-3 percent were observed in leafy vegetables, tomato, okra and brinjal retailers' level. Maximum losses were observed in tomato followed by leafy vegetable, brinjal and okra. This paper describes the various postharvest handling of tomato, brinjal, okra and leafy vegetables at three different levels.

Keywords: *post-harvest handling, Fruits and vegetables, Farmers level, APMC level, Retailers level*

1. Introduction

Vegetables are of huge nutritional value. They are important sources of vitamins & minerals thus, essential components of human diet. The immense diversity in agro-climatic condition across the country enables India to produce large amount of vegetables with current production around 71 million MT, accounts for about 15% of the world's production. Nearly 40% fruits and vegetables are lost every year due to improper handling, packaging and transportation (Vishal Sing et al., 2014, Vishwanathan et al. 1999). Between the farmers' field and the retail market, produce undergoes a number of processes including transportation and storage under various environmental conditions. Vegetables are important crops, providing income to many small farmers, processors, and other entrepreneurs, and serving as health foods for the rural and urban populace. Country ranks second



position in vegetable production but lack of use of proper and scientific handling technologies, considerable amount of produce is wasted which resulted in per capita availability only about 180 gram as against recommended 300 gm per capita. Postharvest of fruit and vegetable losses are over Rs.2.00 lakh crore annually (Mittal R K, 2015). Several factors are responsible for the damages & losses of the fresh produce. For marketing of vegetable, proper & scientific storage, packaging, handling, transportation, storage and distribution are the major problems (Devkota *et al.*, 2014, Kumar D K *et al.*, 2006). Gauraha A.K. (1997) reported the overall post harvest losses (production to consumption) in tomato, cauliflower and potato 32.64%, 22.36%, and 19.79% respectively. Post harvest losses in potato of 12.84%, 12.40% and 9.45% were observed at farm level, wholesale level and retail level respectively (Pandey *et al.* 2003). Verma *et al.*, 2003 assessed the post harvest losses of vegetables and reported that for tomato crop 10%, 14% and 20 % loss at wholesale, retailer and farm level, respectively. Sharma and Singh (2011) studied postharvest losses in twelve vegetable supply chain and reported that maximum losses have been found in tomato, followed by potato, brinjal, chilly, French bean and pea. Singh *et al.* (2013) observed the post harvest losses in vegetables crop vary from 9.47% to 26.57% at different stage of marketing and reported maximum post harvest loss in tomato, followed by brinjal, cauliflower, cabbage and chilies. Post-harvest losses of 24.79%, 18.98%, 22.76%, 28.25% and 25.33% in tomato, green pea, capsicum, cauliflower and cabbage were reported respectively. The losses were more at production level in most of the vegetables. (Singh and Vaidhya, 2005). S N Jha *et al.* (2015) reported that at retailer level tomato loss in one instance was even found to be 18.20%, also glut in the market during the harvesting season led to higher loss.

Out of total post-harvest losses of onion and potato about 60 per cent losses occurs at the farm level and about 25 per cent losses are observed at retailing level (Kumar D K *et al.*, 2006). One of the major problem is lack of awareness and knowledge about how to handle freshly harvested vegetables, otherwise may help in reducing losses by enhancing its shelf life in subsequent operations. Quality of freshly harvested vegetables can be improved at each unit operations from proper harvesting and subsequent postharvest handlings (sorting, grading, packaging, transportation, storage, etc. (Kader A, 2013). Several studies concluded that postharvest losses are still a challenge and no significant declination has been observed within past two decades according to the resources (educational programs, training programs and research programs) utilized. Proper care at farmer's level, wholesaler level and at retailer level is required. Prevention of losses of fruits and vegetables is world wide concern. The main objective of this study is to identify the post harvest handling of harvested vegetables and quantify the magnitude of postharvest losses vegetables at different levels.

2. Material and Methods

Methodology

The methodology of the research consists of a survey at the place and collection of data. The study covers the post harvest handling of selected vegetables in Anand district. The present study is based on information collected from three different level; farmers field, APMC shop holder and retailers around the selected area. A standard questionnaire was prepared to collect data.

Selection of area, crops and sampling design

In Anand district out of eight talukas, five talukas were selected on basis of vegetable crop grown area and in each taluka five villages were selected. In each village few farmers were selected.

Using previous year data on area of cultivation of vegetable crop, major grown vegetable crops of district selected. Accordingly tomato, brinjal, okra & leafy vegetable having major share in area of cultivation of vegetables, these four were selected. The study regarding handling of these crops from harvesting to retailer was done in the following steps;



Farmers level: Data recorded for; maturity indices followed for harvesting, Post-harvest handlings (harvesting methods, collection, methods of collection, sorting, grading, packaging, transportation, selling (direct market, traders, APMC)

APMC level: Data collected for handling, packaging, methods of cooling, storage and transportation.

Retailer level: Transport details, sorting, grading and storage.

3. Results and Discussion

3.1 Post Harvest Handling

At the field level, the losses were estimated from 25 sample farmer's field in each crop. The loss was estimated at the time of harvest, packaging and transportation. Most of the produce transported to nearby markets, however, little amount of produce is transported to distant market hence its losses were not estimated. The losses at the APMC level were estimated from 15 samples from three markets in each produce area. At retailer level the losses were estimated from a three densely populated vegetable markets/retailers from a sample of 20 retailers in each market.

At farmers level:

Tomato: tomatoes are harvested manually by pulling individual fruits. It was observed that during pulling of fruit, over matured and many of the diseased fruits falls from the plants and these fruits remains in the field as loss. For collection of harvested fruits, plastics crates are used having 20 kg capacity. For sending in nearby market, fruits are packed in polythene bags (20-30kg). For distant market place transportation (Delhi, Wagha border, Punjab) plastics crates are used with 25kg net weight. Field losses are observed higher at initial harvesting operations and that reduces in subsequent harvesting operations. No storage is done at farmer's level but for longer distance transport tomatoes are kept under natural shade for a day only and loaded in truck in night.

Brinjal: Brinjals harvested in early morning for selling in local and nearby market, while for distant market, harvesting is done in late afternoon. Harvesting is done by pulling only. Harvesting losses were observed in between 1-3 percent, mainly because of over matured. LDPE bags of 20-30kg are used for packaging. Generally two grades are done (small/big) and diseased, oversized, undersized, shriveled fruit removed during grading. Grading and packaging is done simultaneously. No storage observed at field level. For longer distance transportation CFB of size 44x44x30cm, of 10-12kg are used having manually made holes on opposite side, and sealed with adhesive taping. Sorting with only two grade grading handling operation observed.

Okra: Harvesting is done in early morning by manually. Grading and packaging is done simultaneously, during packaging over matured, cut, diseased and shriveled okra were removed, and contributes 1-2% loss in quantity. LDPE bag of 20-30kg is used for packaging for local and nearby market. Harvester used to wear polyethylene hand gloves to prevent skin injury. No any post harvest handling operation observed other than grading.

Leafy vegetables: Leafy vegetables namely palak, fenugreek and coriander have wide consumption. Palak is harvested by using sickle while fenugreek and coriander are uprooted using hand gadgets. Harvesting is done morning and in evening also. If produce is to sent nearby market early morning harvesting is preferred where as for long distance transportation harvesting is done in evening. Jute bag as well as woven plain jute used for packing of leafy vegetables. Only shattering losses were observed in leafy vegetables. Table 1 shows the losses of vegetables at farmer's level during various operations.



Table 1: Losses of vegetables at farmer's level

Name	Losses(%)							Total
	Harvesting	Collection	Grading	Washing	Packaging	Storage	Transportation	
Tomato	5-8	*	1-2	*	*	*	*	6-10
Brinjal	1-3	*	1-3	*	*	*	*	2-6
Okra	-	*	1-2	*	*	*	*	1-2
Leafy vegetables	0.5	*	-	*	*	*	*	0.5

* No handling operation observed

At APMC level:

It was observed that vegetables were unloaded, weighed, put it aside and selling to retailers. No any further handling operations; cleaning, sorting, grading, storage were observed and no overnight storage also. But for long distance transportation cleaning, sorting grading was done before repacking and weighing. Here produce transport loss of 5-8%, 3-5%, 3-5% & 5-10% were observed in tomato, brinjal, ladies finger & leafy vegetables respectively. Loss of vegetables at APMC level is given in table 2.

Table 2: Losses of vegetables at APMC level

Name	Losses(%)						Total(%)
	Transportation	Sorting	Grading	Washing	Repackaging	Storage	
Tomato	5-8	*	*	*	*	*	5-8
Brinjal	3-5	*	*	*	*	*	3-5
Okra	3-5	*	*	*	*	*	3-5
Leafy vegetables	5-10	*	*	*	*	*	5-10

* No handling operation observed

At retailers' level:

At retailer's level, packed vegetables procured from APMC are cleaned, sorted and rearranged for selling. During sorting loss of 1-2% in tomato while 1-5% was observed in leafy vegetables. Losses in weight during were observed 6-10% & 9-16% in tomato & leafy vegetables respectively (table 3). Losses were observed higher in vegetable procured from other than local market, particularly in tomato and leafy vegetables.

Table 3: Losses of vegetables at retailer's level

Name	Losses (%)				Total (%)
	Transportation	Receiving	Sorting/Grading	Storage	
Tomato	-	-	1-2	5-8	6-10
Brinjal	-	-	1	-	1
Okra	-	-	1	-	1
Leafy vegetables	-	-	1-5%	8-11	9-16



Overall losses:

Table 4 shows the overall losses of vegetables at three different levels. Losses in tomato were observed high among all with 17-28%. 14.5–26% losses were observed in leafy vegetables, while in brinjal and ladies finger losses were observed 7-14% & 6-11% respectively.

More losses are observed at retailer's level for tomato and leafy vegetables, while in case of brinjal and ladies finger no losses observed at retailer's level. As these two vegetables are less perishable in comparison to tomato and leafy vegetables.

Table 4: Losses of vegetables at three different levels (in percent)

Name	Farmers level	APMC level	Retailer's level	Total
Tomato	6-10	5-8	6-10	17-28
Brinjal	2-6	3-5	-	5-11
Okra	1-2	3-5	-	4-7
Leafy vegetables	0.5	5-10	9-16	14.5-26

4. Conclusions

From this study following conclusions can be drawn;

- Harvesting of vegetables by farmers is done mostly in early morning or evening and by manually only. No scientific handling (sorting, grading & packaging) of harvested vegetables observed at farmers and APMC level for leafy vegetables. However, sorting and grading observed in case of tomato, brinjal and okra.
- Generally LDPE bags are used for packaging and size of packing was observed 10kg, 12kg, 20kg, 25kg and 30kg according to end user.
- Losses were observed higher in leafy vegetables followed by tomato, brinjal and okra. Higher losses in leafy vegetables are due to high moisture content and high perishable nature.
- At farmers level losses incurred due to lack of harvesting and subsequent technical knowledge and also not aware of physiology of freshly harvested produce. For reduction in post harvest losses, effective and strong communication between farmers and postharvest engineers is required.
- At retailers level lack of proper storage facility enhances losses.
- No scientific storage observed at any level, therefore it is suggested that low cost evaporative cooling storage should be adopted by retailers to reduce the losses.

References

- [1]. Devkota AR, Dhakal DD, Gautam DM and Dutta JP., 2014, Assessment of fruit and vegetable losses at major wholesale market in Nepal, *International Journal of Applied Science and Biotechnology*, 2(4): 559-562.
- [2]. Gauraha, AK, 1997, Economic Assessment of Post-Harvest Losses in Vegetable Crops, *Indian Journal of Agricultural Marketing*, 11: 38-39.
- [3]. Jha SN, Vishwakarma RK, Ahmad T, Rai A and Dixit AK, 2015, Report on assessment of quantitative harvest and post-harvest losses of major crops and commodities in India. *ICAR-All India Coordinated Research Project on Post-Harvest Technology*, ICAR-CIPHET, P.O.-PAU, Ludhiana-141004.
- [4]. Kumar DK, Basavaraja H and Mahajanshetti SB 2006, An Economic Analysis of Post-Harvest Losses in Vegetables in Karnataka, *Indian journal of Agricultural Economics*, vol 61(1): 134-146.
- [5]. Kader A A, 2013, Postharvest Technology of Horticulture Crops- an Overview from Farm to Fork, *Ethiopian journal of Applied Science and Technology*, special issue no 1.
- [6]. Mittal RK, 2015, Overview of Postharvest Losses and its implications in India. *The First International Congress on Postharvest loss Prevention*, Oct. 3-6, Rome Italy.



Dr. K. V. Vala *et al*, International Journal of Advances in Agricultural Science and Technology,
Vol.6 Issue.5, May-2019, pg. 58-63

ISSN: 2348-1358

Impact Factor: 6.057

NAAS Rating: 3.77

- [7]. Pandey NK Dahiya PS Anshuman K, Kumar NR, 2003, Marketing and assessment of post-harvest losses in potato in Bihar. *Journal of the Indian Potato Association*, 30(3/4):309-314.
- [8]. Sharma G. and Singh SP, 2011, An economic analysis of post-harvest losses in marketing of vegetables in Uttarakhand. *Agricultural Economic Research Review*, 24(2), 309-315.
- [9]. Singh AK, Singh N and Singh, BB, 2013, Marketing and post harvest loss assessment of vegetables in Varanasi district (U.P.). *International Research Journal of Agricultural Economics and Statistics*, 4(1):47-50.
- [10]. Singh RV and Vaidya CS, 2005, Production, marketing, storage and transportation losses of selected vegetables in Shimla and Solan districts. *Agro-Economic Research Centre*, H.P. University, Shimla.
- [11]. Verma A, Singh KP, Kumar A, 2003, Post harvest losses of vegetables: an assessment. *Annals of Agricultural Research* 24:(4): 815-818.
- [12]. Vishal Singh, Md. Hedayetullah, Praveen Z and Jagmohan M, 2014, Postharvest Technology of fruits and vegetables : An overview. *Journal of Post Harvest Technology*, 2(2) :124-135.
- [13]. Vishwanathan, R., Thangavel, K., John Kennedy, Z. and Kailappan, R., 1999, Post-harvest losses of tomato in Tamil Nadu. *Kisan World*, 26(1): 19.