Original Research Article

A study on Post-harvest Losses ofRoyal Delicious Apple in Different Marketing ChannelsatSeraj Valley, Himachal Pradesh, India

Abstract

The present study was conducted in the year 2022-23, to analyse the post-harvest losses occurred in different marketing channels of "Royal delicious" variety of apple. The datawerecollected by using survey method, with the help of questionnaire by interviewing the respondents personally.A sample of 80 apple growers (54 marginal, 17 small and 9 semi medium farmers) was taken, and the existing marketing channels (Channel I,II,III) were identified. Channel I (Producer – Primary market retailer – Consumer), Channel II (Producer – Wholesaler – Secondary market retailer – Consumer) and Channel III (Producer – Pre-harvest contractor – Wholesaler – Secondary market retailer – Consumer).Out of total 145 market functionaries a sample of 20% i.e. 30 market functionaries were selected randomly.It was revealed that, on an average a total of 12.4% of produce was lost per quintal of produce i.e. 12.4kg/quintal, with Channel III having highest average post-harvest losses 17.4% of produce lost per quintal of produce. In Channel II the average post-harvest losses were found 14.05% loss per quintal of produce. And the Channel I had the minimum post-harvest losses of just 5.75% loss per quintal of produce. In economic terms, average loss of Rs. 744/quintal was observed at the price of Rs. 60/kg.It was concluded that marketing channel III was having highest losses because of more middlemen in the channel and by looking into the channel, at wholesaler level there were having the highest loss. These losses can be minimized by having more cold storage facilities, and quick dispose of produce from producer to consumer.

Keywords: *Averagepost-harvest loss, Apple growers,Malus domestica,Producer level, Wholesaler level*

1.INTRODUCTION

Apple (*Malus domestica)* is the thirdmost cultivated fruit in the world, currently China being the leading producer followed by the United state of America, India ranks fifth in the production of the apple. Apple consists of key nutrients in it like fiber, vitamins, minerals and flavonoids which are required in day-to-day life of individuals. Apple is considered good for the heart due to the presence of potassium, quercetin antioxidant provides anti-cancer properties, high fiber content regulates blood sugarlevel, according to USDA (U.S. Department of Agriculture).

Apple fruit requires special climatic conditions for its production, i.e. it requires chilling period. 'Royal delicious' variety requires normally around 900 hours to 1000 hours of chilling period for a good production(National Horticulture Board of India), because of these special climatic requirements the apple is mostly grown inNorth Western Indian Himalayan region because of the favourable climatic conditions. According to APEDA (The Agricultural and Processed Food Products Export Development Authority) 2021 – 22 annual report, Jammu

and Kashmir is the country's leading producer ofapple producing more than 70% of the produce, Himachal Pradesh is second in the production of apple with 26.42% of produce, then followed by Uttarakhand 2.266% production, Arunachal Pradesh with 0.30% and Nagaland with only 0.07% production.

The post-harvest losses of apple are very common because of itshigh perishable nature and low shelf life. Because of it a portion of produce is lost at different points in the marketing channel i.e. starting from the farm level till it reaches the ultimate consumers for the consumption. There is always a loss of small portion of produce even if the produce is taken well care off. From the farm level till it reaches the consumer there are different post-harvest activities that are performed like harvesting, handling, storage processing, packaging, transportation and marketing, and to perform these activities different middlemen or market functionaries are involved like pre harvest contractor, wholesaler, retailer. And as the produce goes hand to hand from the producer to different market functionaries till it reaches the final consumer, a small portion of it is lost because of high perishable nature. The present study was conducted to analyse the post-harvest losses in different marketing channel of apple, its reasons and to minimise this loss.

In an earlier study by (Guleria & Kumar, 2022) revealed that the highest losses were seen at the wholesaler level which was around 8.48kg/quintals for different marketing channels which valued at around Rs 440.96 per quintal. Another study suggested that minimum support price for the crop should be introduced by the government. Unlicensed growers should be checked. The government should introduce precooling facilities at farm level and built ropeways for transportation. Women in the state should be trained to work in post-harvest handling and processing the produce of apple crop (Dhaliwal, 2014). Annually there is an aggregate loss of 23000 crores of horticultural crop during post-harvest management like transportation, delays due to high intermediaries. Due to poor storage and infrastructure facilities, the producer attempts to dispose off-produce quickly in the shortest possible time. This negates his capacity to hold the stock for better prices during off-seasons and leads to a natural slump in the market prices(Hassan, 2021). The aggregate maximum post-harvest losses were found in tomato, followed by okra, onion, cabbage, chilly, cauliflower, brinjal, pumpkin and potato. The study has suggested that establishment of producer cooperatives to switch various activities relation to production and marketing of vegetables(Kumar, Saroj, & Kispotta, 2016)

2. METHHODOLOGY

Multistage stratified random sampling procedure was adopted for the selection of the sample. In 1st stage, out of the 12 districts in Himachal Pradesh, Mandi district was selected purposively because of its significant contribution with respect to area and production of apple in the state. 2nd stage, out of the 11 blocks, Seraj block was selected purposely on the basis of highest area under apple production, in 3rd stage out of the total 226 villages, 11 villages were selected randomly for the study.

In stage 4th, the respondents weredivided into different categories according to their size of the land holding, marginal (less than 1 hectare), small (1-2.0 hectare), semi medium (2.1-4.0 hectares), medium (4.1-10 hectares), large (more than 10 hectares). A sample of 10% of apple growers was selected randomly from the selected villages to get a sample of 80 respondents viz. 54 marginal, 17 small and 9 semi medium apple growers respectively, there were no medium and large apple growers in the study area.The district market i.e.

Agricultural Produce & Livestock Market Committee (APMC) Mandi was selected in the 5th stage.

In the 6th stage the market functionaries were selected randomly from the selected market, the survey method was adopted for collecting data of post-harvest loss in apple. The data was collected from personal visits interviewingthe selected respondents and intermediaries in the marketing of apple with the help of questionnaire.

2.1 Analytical technique

Post-harvest losses were assessed as

1)Average physical post-harvest losses (in kg).Simple averages were used to calculate post harvest losses at different stages of marketing.

Post-harvest losses = Quantitative loss + Qualitative loss + Spoilage to other factors

Quantitative loss = loss due to spillage of crops, microbial attack and pest attack

Qualitative loss = loss due to physiological changes i.e. change in shape, texture and quality of fruit

Spoilage to other factors = loss due to lack of storage, transportation or spoilage to any other factor.

2) Economical post-harvest losses (in Rupees).

3. RESULTS AND DISCUSSION

3.1 Identifying marketing channels adopted by apple growers

The movement of produce from the producer to the ultimate consumer is marketing and this process is performed by different market intermediaries or market functionaries. The produce passes from one functionary to the other in the form of chain, this chain is defined as marketing channel. The following marketing channelswere identified in the study area**.**

Channel I: (Producer - Primary market retailer - Consumer).

Channel II: (Producer – Wholesaler - Secondary market retailer - Consumer).

Channel III: (Producer – Pre-harvest contractor – Wholesaler - Secondary market retailer - Consumer).

As in Table 1 different categories of apple growers are shown and next to it is the marketing channels adopted by these apple growers in the study area

Table 1. Adopted marketing channels by the sampled apple growers.

S. No. (Serial Number)	Farm category	Marketing Channels			Total
		I	II	III	
1.	Marginal	8	40	6	54
2.	Small	2	12	3	17
3.	Semi medium	1	7	1	9
	Overall	11	59	10	80

Table 1: shows the marketing channels adopted by sampled apple growers in the study area, as shown a majority of 59 apple growers adopted Channel II (Producer-Wholesaler-Secondary market retailer-Consumer), followed by Channel I (11 apple growers), and Channel III (10 apple growers).

3.2 Average post-harvest losses in apple (physical & economical)per quintal of produce in different marketing channels.

A small portion of produce is lost at different level in the marketing channels, to the different factors such as transportation, lack of storage, disease, harvesting injuries etc. The table 2 shows the total loss per quintal of the produce handled by different market functionaries.

Table 2. Average post-harvest losses in apple (physical & economical)per quintal of produce in different marketing channels.

S.No.	Different levels	Marketing Channels			Sample average	Losses in economic terms (At Rs. 60/kg)
		I	II	III		
1.	Producer level	2.15	2.75	2.25	2.38	143
2.	Pre harvest contractor level	-	-	2.7	2.7	160
3.	Wholesaler level	-	7.5	8.25	7.9	474
4.	Retailer level	3.6	3.8	4.2	3.85	231
	Total	5.75	14.05	17.4	12.4	744

Table 5: shows the average post-harvest losses in apple (physical & economical) in different marketing channels, the highest losses occur in Channel III i.e. 17.4 kg/quintal of produce, followed by the Channel II with 14.05 kg/quintal of produce and lowest in Channel I with only 5.75 kg/quintal of produce. On average at wholesaler level was having highest loss i.e. 7.9 kg/quintal of produce and the loss was lowest at producer level i.e. only 2.38 kg/quintal of produce. In economic terms, the average total loss was Rs. 744 per quintal of produce at the rate of Rs. 60/kg, looking at different farm levels the highest loss occurred at wholesaler level with Rs. 474 loss per quintal of produce and was lowest for producer level with Rs. 143/ quintal. And Rs 160/quintal, Rs. 231/quintal for Pre harvest contractor and retailer level.

3.2 Average post-harvest losses in different marketing channels

Losses in Channel I: (Producer – Primary market retailer – Consumer)

Above table 2 shows the total loss in the marketing channel was 5.75 kg/quintal of produce, i.e. a total of 5.75 kg was lost in marketing channel I per quintal of produce. In Table 3, different factors are shown to which the loss occurs in the channel I at producer and retailer level.

Table 3. Average Physical post-harvestlossesper quintal of the produce in Channel I.

S.No.	Particulars	Average losses in Kg/quintal
(a)	At Producer level	
1.	Immature harvest	0.6
2.	Physiological	0.3
3.	Disease	0.5
4.	Lack of storage	0.25
5.	Harvesting injuries	0.5
	Total losses at farm level	2.15
(b)	At Retailer level	
1.	Physically damage	0.75
2.	Rotten	0.4
3.	Lack of storage	1.6
4.	Transportation loss	0.85
	Total losses at retailer level	3.6
(c)	**Total average post-harvest loss in Channel I**	5.75

Table 2: shows the average physical post-harvest lossesper quintal of produce of apple, in channel I an average loss of 5.75 kg/quintal of produce was observed. In channel I average loss at producer level was 2.15 kg/quintal and at retailer level the average loss was 3.6 kg/quintal of produce.

Losses inChannel II: (Producer – Wholesaler – Secondary market retailer – Consumer)

As from table 2 it is clear that 14.05 kg of produce was lost per quintal of produce in channel II. Table 4 shows the different factors to which the produce was lost at different marketing levels in the marketing channel II.

Table 4. Average physical post-harvest lossesper quintal of producein Channel II.

S.No.	Particulars	Average losses in Kg/quintal
(a)	At Producer level	
1.	Immature harvest	0.6
2.	Physiological	0.45
3.	Disease	0.5
4.	Lack of storage	0.7
5.	Harvesting injuries	0.5
	Total losses at farm level	2.75
(b)	At Wholesaler level	
1.	Physically damage	4.5
2.	Rotten	0.8
3.	Lack of storage	1.45
4.	Transportation loss	0.75
	Total losses at Wholesaler level	7.5
(c)	At Retailer level	
1.	Physically damage	0.75
2.	Rotten	0.6
3.	Lack of storage	1.6
4.	Transportation loss	0.85
	Total losses at retailer level	3.8
(d)	**Total average post-harvest loss in Channel II**	14.05

Table 4: shows the average post-harvest lossesper quintal of produce, in channel II an average loss of 14.05 kg/quintal was observed. In channel II the average loss at producer level was lowest i.e. 2.75 kg/quintal of produce, at wholesaler level it was highest i.e. 7.5 kg/quintal of produce and at retailer level the average post-harvest loss was 3.8 kg/quintal of produce.

Losses in Channel Channel III: (Producer – Pre harvest contractor – Wholesaler – Secondary market retailer – Consumer)

A total of 17.4 kg was lost per quintal of produce in channel III as shown in table 2, in table 5 the different factors are shown to which the produce was lost in the marketing channel III at different marketing levels.

Table 5. Average Physical post-harvest losses per quintal of producein Channel III.

S. No.	Particulars	Average losses in kg/quintal
(a)	At Producer level	
1.	Immature harvest	0.65
2.	Physiological	0.3
3.	Disease	0.5
4.	Lack of storage	0.3
5.	Harvesting injuries	0.5

	Total losses at farm level	2.25
(b)	At pre-harvest contractor level	
1.	Lack of storage	1.5
2.	Physical damage	0.45
3.	Rotten fruits	0.25
4.	Spoilage	0.5
	Total losses at pre harvest contractor level	2.7
(c)	At Wholesaler level	
1.	Physically damage	4.7
2.	Rotten	1.2
3.	Lack of storage	1.6
4.	Transportation loss	0.75
	Total losses at Wholesaler level	8.25
(d)	At Retailer level	
1.	Physically damage	1.4
2.	Rotten	0.5
3.	Lack of storage	1.7
4.	Transportation loss	0.6
	Total losses at retailer level	4.2
(e)	**Total average post-harvest loss in Channel III**	17.4

Table 5: shows the average post-harvest losses per quintal of produce, in Channel III an average loss of 17.4 kg/quintal occurred. In channel III the average loss at producer level was lowest i.e. 2.25 kg/quintal and was highest at wholesaler level i.e. 8.25 kg/quintal of produce was lost. At Pre-harvest contractor level a loss of 2.7 kg/quintal of produce occurred and a loss of 4.2 kg/quintal at retailer level.

From the study it was concluded that, in Channel III the post-harvest loss was maximum (17.4kg/quintal) because this channel was longest among others and had more middlemen (Pre harvest contractor, wholesaler, retailer) involved in it. As compared to the shortest marketing channel I (Producer, retailer) which only had an average loss of 5.75kg/quintal and it was minimum loss among the three channels. It was also revealed that the at wholesaler level, an average loss of 7.9kg/quintal of produce was seen which was the maximum at any level and it was lowest (2.38kg/quintal of produce) at producer level. The major factors responsible for the loss were lack of storage, physical damages to produce, transportation loss, harvesting injuries and rotten fruit.

4. CONCLUSION

The post-harvest losses in different marketing channel in the study area, was found that the average post-harvest loss was about 12.4 kg/quintal of produce which was calculated about Rs. 744 per quintal of produce. Channel III was having highest (17.4kg/quintal) post-harvest losses which, followed by channel II (14.05 kg/quintal) and then lowest in channel I (5.75 kg/quintal). At different farm levels, wholesaler was having highest average post-harvest loss (7.9 kg/quintal) which was about Rs. 474 per quintal of produce, followed by retailer level (3.85kg/quintal, Rs. 231 per quintal of produce), then pre-harvest contractor level (2.7 kg/quintal, Rs. 160 per quintal of produce, and producer level (2.38 kg/quintal, Rs. 143 per quintal of produce).

To minimise these losses, the packing of the produce becomes most important as it reduces the losses that occur during transportation, avoids any further damage to the fruits that are already damaged or having harvesting injuries. The storage facilities are not available at every place and have limited access, so to minimise these losses it is advised to have adequate storage facilities as well as access to wide range of apple growers. The loss occurs due to transportation can also be reduced by increasing connectivity through roads and by regular maintenance of roads as majority of transportation is done through roads. The unnecessary involvement of any middlemen should also be avoided to reduce the losses and it is advised to producers to choose the smaller marketing channels as compared to a very long marketing channels.

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