



Research Article

POST-HARVEST LOSSES OF PINEAPPLE AT VARIOUS STAGES OF HANDLING FROM THE FARM LEVEL UP TO THE CONSUMER IN MANIPUR

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Abstract: The research study was carried out in Imphal East district of Manipur during the year 2016-17. Following the simple random sampling, 120 respondents were selected from four villages. The post-harvest losses at farm level were quantified, which accounted for about 8.44 percent loss. Losses at wholesale market including transportation accounted for about 4.93 percent. The losses at retailer, storage unit and consumer level accounted for about 5.46 percent, 3.19 percent and 6.82 percent respectively. The post-harvest losses at different stages from farm level up to the consumer accounted for about 34.49 percent.

Keywords: *Pineapple, Post-harvest losses, Wholesale, Consumer*

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Introduction

Since independence India has made a lot of progress in agriculture. Horticulture, which has gained commercial tone in the recent years, is an important component of agriculture, having significant role in the economy of the country. Among the number of sub-fields in agricultural sector, horticulture has played a dominant role in the agricultural output throughout India. There has been growing importance of fruit and vegetables in the agricultural economy of India, their production and marketing deserve the focused attention of all the stakeholders. India is the second largest producer of fruits (44 million tonnes) and vegetables (87.5 million tonnes) with a unique position in fruits like mango, litchi, banana, pineapple and grapes. India's share in the world production is about 10.1 % in fruits and 14.4 % in vegetables. Though India has a major share in the production of fruits and vegetables and owing to low productivity and increased post-harvest wastages, the per capita availability of fruits and vegetables in India is as low as 100 grams per day and 200 grams per day respectively against the minimum dietary requirement of 140 and 270 grams of fruits and vegetables per day. During 2010-11, its contribution in the world production of fruits and vegetables was 12 % and 14 % respectively. India has started putting greater thrust for the development of horticultural sector in order to exploit the country's vast potential. Horticultural crops not only provide nutritional and healthy food, but also generate cash income to growers. The input-output ratio is much higher than that in the field crops. Pineapple is an important horticultural crop cultivated in all the tropical and subtropical countries. India is fourth among the pineapple producing countries of the world based on 2016 data. There is a sizeable increase in area and production of pineapple in India. Pineapple is grown on a large scale mostly in Assam, Meghalaya, Tripura, Manipur, West Bengal, Kerala, Karnataka and Goa and on a small scale in Gujarat, Maharashtra, Tamil Nadu, Andhra Pradesh, Orissa, Bihar and Uttar Pradesh. Pineapple is one of the most popular fruits grown extensively in the hills and plains in North East Region of India. 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).

These characteristics make them highly perishable resulting in huge post-harvest losses. Beside these perishable characteristics of the horticultural produce, inadequate arrangement for post-harvest management like storage, processing, preservation and marketing facilities lead to the problem of post-harvest losses. It is estimated that a total of 20-40% of all crops in developing countries is lost to postharvest losses. Losses are due to decay, mechanical damage, physiological disorders, and even to the action of several fruit flies, during harvest, storage and transport. These losses occur not only in developing countries.

Materials and Methods

The present study was conducted in Manipur where Imphal East district is being selected as the district being the most extensive production of pineapple in the state. A complete list of all the revenue villages obtained from related block office of the selected sample development blocks were prepared in which the villages which have more area and production under pineapple produced were enlisted by using simple random sampling method without replacement. A sample survey of villages was selected for the purpose of the study. The pineapple growers were selected randomly from each village so as to constitute a sample size of 120 respondents from the area under study. The primary data needed for the present study were collected by during pineapple harvesting and marketing by using an adopting personal interview method from the selected pineapple growers with the help of a survey method using well-structured pre-tested questionnaire schedule. The collected data were analyzed using simple averages and percentages to compute the postharvest losses.

Results and Discussion

Post-harvest loss at farm level

The post-harvest loss in pineapple was assessed at farm level first. Losses during this stage were based on the damage sustained at the time of harvesting. It was observed that in case a total quantity of 37000 quintal harvested in the samples, about 2540 quintals were lost, which accounted for about 6.82 percent due to various reasons [Table-1].

Post-harvest losses at wholesale market including transportation

After harvesting, most of the farmers transport the fruits to the market in trucks and tractors. While loading the fruits in trucks, they are directly dumped into lorry without any packaging. At the time of unloading the fruits in the wholesale market, the damaged, over ripened, mechanical damage which includes loading and unloading are separated out. Losses in the wholesale market including transportation were quantified in wholesale markets. The total quantity transported was 3,385 quintals, out of which 104.65 quintal (3.09 %) 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 accounting to 0.77% percent.

Table-1 Post harvest losses of pineapple at farm level, (n=120)

	Quantity (q)	Percent loss
Quantity harvested	37000	-
Farm level losses due to		
Harvesting injuries	68.76	1.85
Immature	59.64	1.61
Over ripe	48.62	1.31
Handling	26.18	0.7
Sorting	19.56	0.52
Insect and disease attack	11.96	0.32
Rotting	10.5	0.28
Other	8.74	0.23
Total PHL at farm level	253.96	6.82

Table-2 Post-harvest losses of pineapple at wholesale market including transportation, (n=10)

	Quantity (q)	Percent loss
Quantity purchased	3385	-
Post-harvest losses due to		
Mechanical damage (loading/unloading)	42.3	1.25
Over ripening	36.2	1.07
Spoilage due to disease	26.15	0.77
Total PHL	104.65	3.09

Post-harvest losses of pineapple during storage

For a sampled quantity of 1585.00 quintal stored, 89.60 quintal fruits were lost amounting to 5.64 percent of fruits loss. The major loss was due to over ripening spoilage which contributed to a loss of about 38.40 quintal (2.42%). The loss due to spoilage due to disease and physical damage was about 26.60 quintal (1.67%) and the loss due to variation in temperature was 24.60 accounting to 1.55 percent. 4. Post-harvest losses of pineapple at the retail level. When data was collected at the retail level, it was found that the losses were about 5.44 percent i.e., out of 59.50 quintal sampled nearly about 3.25 kg were wasted. The major loss was due to spoilage due to mechanical damage accounting to about 2.58 percent. The loss due to over ripening was about 2.08 percent and immature and unmarketable size accounted for 0.78 percent.

Post-harvest losses of pineapple at the processing units

The post-harvest losses of pineapple fruits during processing units were estimated and the details are given in [Table-5]. The total quantity of fruit handled was 250 million tons from two processing units, out of which 8 million tonnes about 4.31% was lost. The major loss was due to immature, over ripening and pulp extraction (1.24%, 1.18% and 1.24%) followed by fruit cutting and fruit washing (0.34% and 0.31%, respectively).

Table-3 Post-harvest losses of pineapple during storage, (n=10)

	Quantity (q)	Percent loss
Quantity stored	1585	-
Post-harvest losses due to		
Over ripening	38.4	2.42
Spoilage due to disease and physical damage	26.6	1.67
Variation in temperature	24.6	1.55
Total PHL	89.6	5.64

Post-harvest losses of pineapple at the consumer level

The data was collected at the consumer level, reveals that the losses were about 6.82 percent i.e., out of 70 kg sampled nearly about 5.2 kg were wasted. The

major loss was due to physical injury. The loss of spoilage due to disease was 1.97 percent and due to over ripening accounted to 1.57 percent respectively.

Table-4 Post-harvest losses of pineapple at the retail level, (n=10)

	Quantity (q)	Percent loss
Quantity purchased	59.5	-
Post-harvest losses due to		
Mechanical damage	1.54	2.58
Over ripening	1.24	2.08
Immature and unmarketable size	0.47	0.78
Total PHL	3.25	5.44

Table-5 Post harvest losses of pineapple at the processing unit, (n=2)

	Quantity (MT)	Percent loss
Quantity handled	250	-
Post-harvest losses due to		
Immature	3.1	1.24
Over ripening	2.96	1.18
Cutting	0.85	0.34
Fruit washing	0.3	0.31
Pulp extraction	0.79	1.24
Total PHL	8	4.31

Table-6 Post-harvest losses of pineapple at the consumer level, (n=10)

	Quantity (kg)	Percent loss
Quantity purchased	70	-
Post-harvest losses due to		
Physical injury	2.5	3.28
Spoilage due to disease	1.5	1.97
Over ripening	1.2	1.57
Total PHL	5.2	6.82

Overall post-harvest losses of pineapple

The stages were quantified at farm level, transporting and marketing, storage, retailer, processing unit and consumer level. The overall loss accounted was 32.12 percent (6.82 % at farm level, 3.09 % at wholesale market and transportation, 5.44 % in retail market, 5.64 % in storage unit, 4.31 % in processing unit and 6.82 % in consumer level respectively). It is clear from the results of the study that, post-harvest losses in pineapple from farm level up to the consumer was found to 6.82 percent at farm level, 3.09 percent at market level including transportation level, 5.64 percent during storage, 5.44 percent at retailer level, 4.31 % at processing unit and 6.82 percent at consumer level accounting for total loss of 32.12 percent. 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 postharvest losses at different levels. There is a need to create awareness among the farmers regarding measures to control the post-harvest losses of pineapple at different levels and should provide suitable facilities for avoiding post-harvest losses.

Table-7 Overall post-harvest losses of the pineapple from farm level up to the consumer

SN	Stages	Quantity (tones)	Losses (tones)	Losses (%)
1	Farm level	370	25.4	6.82
2	Wholesale market including transportation	338.5	10.46	3.09
3	Retailer	5.95	3.25	5.44
4	Storage unit	158.5	89.6	5.64
5	Processing unit	2,50,000	8000	4.31
6	Consumers	0.07	0.052	6.82
	Total PHL			32.12

Suggestions to minimize the post-harvest losses

To minimize the losses, it is essential that the producer should be imparted with better knowledge of the post-harvest management.

Harvesting: When the fruit are maturing in the field, they change their form day today. There is a time when the fruit will be at peak quality from the stand-point of color, texture and flavor. After the fruit is harvested, it may quickly pass beyond the peak quality condition. Since the heat further deteriorates the fruits and speed micro-organisms growth, the harvested fruits must be cooled if not processed immediately.

The continual loss of water by harvested fruits due to transpiration, respiration and physical drying of cut surface result in wilting, loss of plumpness of fleshy fruits and loss of their weight. In many processing plants; it is a common practice to process fruits immediately. Cooling of fruits in the field is a common practice in some areas. Liquid nitrogen cooled trucks may next provide transportation of fresh produce to the processing plant or directly to the market.

Sorting and Grading: These steps covers two separate operations-

Removal of non-standard fruits and possible of foreign bodies after washing and Quality grading based on variety, dimensional and maturity stage criterion.

Packaging: The packaging of fruits should protect them from injury and water loss, and be convenient for handling and marketing.

Transportation: Quick and cheap transportation is the need of the hour. The farmers of a certain area should pool their resources at some assembling point so that they can get the benefits of bulk transportation.

Storage: It should provide maximum possible protection from ground moisture, rains, insects, pests, moulds, rodents, birds, fire, etc.

It should provide the necessary facility for inspection, disinfection, loading, unloading, cleaning and re-conditioning.

It should protect from excessive moisture and temperature favorable to both insects and mould development.

It should be economical and suitable for a particular situation.

Marketing: Marketing should be done by keeping in mind the life of the harvested fruits. The marketing procedure should not be too long and easily accessible markets should be chosen for the purpose.

Application of research: The study aims to understand the post-harvest losses of pineapple in the research area which can future improve as a whole.

Research Category: Agricultural Economics

Abbreviations: PHL-Post harvest loss

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Study area / Sample Collection: Imphal east district, Manipur

Cultivar / Variety / Breed name: Pineapple

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

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