



Short communication

## Assessment of post harvest losses in banana grown in Gujarat

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### ABSTRACT

The present investigation was undertaken to assess post harvest losses (at field, traders' and processors' level) in Gujarat. The effect of various ripening methods on post harvest losses in five varieties viz., Robusta, Grande Naine, Sona, Mahalaxmi and Shreemanthi were determined. The study revealed that overall post harvest loss in banana after harvesting till ripening was found to be 15.43%, which included losses at field level (0.77%), at trader's level comprising of transportation and handling losses (5.86%) as well as ripening losses (8.80%). Only negligible losses were observed during processing of banana. The highest loss (16.00%) was observed in the case of smoking + room temperature method of ripening, while the lowest (4.66%) was observed under ethephon + air-cooled chamber method. Ethephon + ice treatment method resulted in ripening loss to the tune of 7.43%, but the method was most widely adopted in Gujarat owing to its convenience and better appearance of bananas after ripening.

**Key words :** Banana, post harvest losses

Banana is one of the most important fruit crops grown in India. Gujarat is the fifth largest producer of the banana in India (Negi *et al*, 2002). Bananas are harvested at various stages of its maturity depending upon distance to market and the purpose for which it is cultivated, such as culinary, table purpose, etc. Most commonly the fruit is harvested when the ridges on the surface of the skin changed from angular to round i.e., after attainment of the three-fourths full stage (Kotecha and Desai, 1995). Harvested bananas in Gujarat are then either stored for ripening or sold as raw/fresh fruit. None of the farmers go for the processing of bananas, because, operations for banana processing are very tedious, time consuming and expensive. During the market glut, the prices crash down and the farmers suffer heavy losses due to the distress sale. Due to poor transportation and storage facilities, a sizeable quantity of this fruit is wasted due to its perishable nature. The total estimated loss during post harvest handling of banana in Assam was about 22% (Anonymous, 2005). Whereas, the same was about 19 to 21% in Tamil Nadu (Gajanana *et al*, 2002) and about 18 to 29% in Karnataka (Sreenivasa Murthy *et al*, 2002). Processing and product development through value addition is the best alternative to reduce the post harvest losses. To improve the marketing system, it is

essential to create awareness among the growers, farm workers and managers, traders and exporters about the extent of post harvest losses. Considering all these facts, the study was undertaken to assess the post harvest losses of banana, during post harvest ripening.

### Sampling procedure and data collection

As defined by Acharya and Agrawal (2001), the present marketing channels of banana, three stages viz., field level, traders level (transit and ripening losses) and processors level were identified to examine the post harvest losses. The multistage random sampling technique was used for the selection of study area and the sampling units (Gajanana *et al*, 2002; Sreenivasa Murthy *et al*, 2002). In the second stage, six districts of Gujarat, namely Anand, Surat, Vadodara, Narmada, Bharuch and Junagadh were selected because of their maximum aggregate contribution (94%) to the total state production and considered as an individual zone. In the third stage, two tehsils from each zone were selected in such a way that they represented major banana growers of Gujarat. In fourth stage, one village from each tehsil (a total of twelve villages) was selected. In the fifth stage, 3 banana growers of different categories (small, medium and large) were finally selected from each

of these villages using random number table for the data collection. Thus, a total 36 banana growers were selected randomly. The details at trader's level were collected from 20 traders of 3 markets (Khanderao market at Vadodara, Khamasha market at Ahmedabad and Banana wholesaler market at Junagadh) as well as villages Sarsa (Dist. Anand) and Bharuch, which were selected in such a way that it covered all the trading and ripening practices of banana followed in Gujarat. Since the banana processing industries are very few in Gujarat, the data were collected from the available processors in the area, without adopting any sampling procedure. The estimation of losses at retail level was not included in the study.

The data related to post harvest losses at different stages were collected during banana harvesting and marketing season through observation as well as personal interview of the respondents as per the schedules prepared.

### Assessment of post harvest losses

The post harvest losses at field level were worked out on the basis of the data collected from 36 sample fields (3 farmers of 12 villages). Each sampling unit was made up of 3 sample bunch from each field. Thus, the loss was estimated from 108 bunches of different sizes randomly drawn from the lots. The losses at trader's level *i.e.*, transit and ripening losses were estimated from 20 randomly selected sample traders. The transit loss at trader's level was estimated from 15 sample traders cum agents engaged in banana ripening from 3 markets *viz.*, Khanderao market at Vadodara, Khamasha market at Ahmedabad and Banana wholesaler market at Junagadh (5 traders from each market), who mostly trade the unripe banana to short distance centers within Gujarat and 5 pure traders from village Sarsa of Anand district (3 traders) and Bharuch (2 traders), who mostly trade unripe bananas to long distance marketing centers located in nearby states like Delhi, Punjab, Haryana, Rajasthan, Jammu and Kashmir and Madhya Pradesh by road. The ripening loss at trader's level was

estimated from the above 15 sample traders cum agents engaged in banana ripening from 3 markets. The losses at processor's level were estimated at 2 processing industries (one is large scale and one is small scale).

### Statistical analysis

The data on various post harvest losses in banana at different stages were subjected to analysis of variance technique using Randomized Block Design (Filmore *et al*, 1982).

### Losses at field level

The farmers were not found to sort the harvested banana in the field. However, some of the bananas were discarded at the field which was considered as loss at the field level. The average loss at field level in Gujarat was estimated as 0.77% (Table 1).

The major losses were damage and dropping of fruits during harvesting, handling, loading of bunches, refusal of twin fingers, immature fruits, spoilage as well as pre-harvest ripening of fruit, which made the banana fruits unsuitable for long distance transportation and gave the undesired quality attributes like colour, flavour and taste. Generally, farmers sold the bananas when there was good demand in the market so as to get higher economic returns, *i.e.*, during early season or during the scarcity of banana in the market. Therefore, the farmers harvested banana at early stage without considering full and even maturity in the bunch. So, immature fruits mainly contributed to increase in the losses at the field level. Further, during the market glut the harvesting of banana had to be delayed by the farmers which increased the spoilage and pre-harvest ripening of fruit.

### Losses at traders' level

The losses at traders level included the losses occurred during transportation, unloading and handling as well as during ripening of banana. The district wise average losses during transportation, unloading and handling of banana are given in Table 2.

**Table 1. Losses in banana at field level**

District	Losses at field level (%)				Total loss	Actual total loss
	Damaged	Dropped	Spoiled	Others		
Anand	0.25	0.13	0.09	0.32	0.79	0.84
Surat	0.26	0.14	0.11	0.26	0.77	0.81
Vadodara	0.22	0.14	0.11	0.29	0.76	0.80
Narmada	0.20	0.13	0.09	0.26	0.68	0.72
Bharuch	0.26	0.14	0.08	0.21	0.69	0.73
Junagadh	0.18	0.13	0.09	0.26	0.66	0.70
Average	0.23	0.14	0.10	0.27	0.73	0.77
SEm	-	-	-	-	-	0.050
CD ( $P=0.05$ )	-	-	-	-	-	NS
CV %	-	-	-	-	-	28.33

**Table 2. Losses during transportation, unloading and handling of banana**

District	Particulars of respondents	Per cent losses observed/reported		
		Weight loss	Trans- portation loss	Actual total loss
Ahmedabad	Trader cum	2.32	3.58	5.90
Vadodara	agent engaged in	2.13	3.62	5.75
Junagadh	banana ripening	1.68	2.53	4.21
Anand & Bharuch	Trader alone	2.95	4.63	7.58
Average	—	2.27	3.59	5.86
SEm	—	0.350	0.330	0.640
CD ( $P=0.05$ )	—	NS	1.028	1.968
CV %	—	34.28	20.79	24.39

The lowest loss (4.21%) was found in Junagadh due to the trading and transportation of banana in limited area and short distances of transportation. Whereas, the maximum loss (7.58%) was found in case of pure traders (Dist. Anand and Bharuch) who dispatched the banana to long distance marketing centers located in nearby states of Gujarat.

**Losses during ripening**

The ripening practices in Gujarat varied from area to area and accordingly the ripening losses. The district wise average losses during ripening are given in Table 3. The significantly higher loss to the tune of 13.20% in Junagadh district was attributed to the difference in trading practices of banana along with its ripening practices. In Junagadh, bananas were not sold on weight basis but sold on number basis. Therefore, the agents engaged in banana ripening did not pay their attention towards the effects of ripening practices on the weight loss due to moisture loss and other qualitative losses. They adopted a practice of ripening under smoking and by mixture of calcium carbide and water, which was economical. While in case of Ahmedabad and Vadodara, the bananas were sold on weight basis, which necessitated reducing the weight loss during ripening. Therefore, they used improved methods for the ripening of

**Table 3. District-wise losses during ripening of banana**

Trader	Per cent losses observed/reported		
	Weight loss	Spoilage loss	Actual total loss
Ahmedabad	5.30	2.00	7.30
Vadodara	4.50	1.40	5.90
Junagadh	9.40	3.80	13.20
Average	6.40	2.40	8.80
SEm	0.540	0.400	0.670
CD ( $P=0.05$ )	1.675	1.248	2.081
CV %	18.67	37.27	16.89

**Table 4. Effect of ripening methods on losses in banana**

Sl. No.	Method of ripening	Ripening losses observed/reported (%)		
		Weight loss	Spoilage loss	Actual total loss
1	Ethephon + Air-cooled chamber	3.33	1.33	4.66
2	Ethephon + Ice treatment	5.57	1.86	7.43
3	Smoking + Ice treatment	9.17	3.00	12.17
4	Smoking + Ambient condition	10.00	6.00	16.00
5	Mixture of calcium carbide and water + Ice treatment	9.50	4.00	13.50

bananas. The principal causes for ripening losses in banana included water loss, detachment of fingers from bunch, peel splitting during ripening, uneven ripening, disease infection and others. All these losses interacted depending upon the external conditions of banana, *i.e.*, temperature and relative humidity.

**Effect of ripening methods on losses**

The average values of losses during different methods of banana ripening are given in Table 4.

The higher weight loss during the ripening treatments, *i.e.*, smoking and the calcium carbide + H<sub>2</sub>O → Acetylene gas which hastens ripening. It does not produce large amount of heat were due to the high amount of moisture loss from the banana. The peel of bananas remained green even though internal ripening already commenced. Therefore, in such case, the peel colour did not reflect the internal status of banana. After 4 to 5 days under ripening the peel splitting was observed under ethephon + ice treatment method. However, the overall appearance was good indicating good quality of bananas. This was the most widely adopted method of ripening in Gujarat. The lowest loss (4.66%) and excellent appearance of banana was found when ethephon + air-cooled chamber method of ripening was followed.

**Losses at processors' level**

In Gujarat, the processing of banana for value addition was found to be limited to banana figs (dried banana) and banana chips. The banana chips industry was mainly of cottage industry level whereas, the banana figs processing plant was big industry. The total output, as reported by the processor of banana figs was 11 to 12% of the raw material (ripe banana with peel). Out of 11 to 12% dried banana, figs were to the tune of 9 to 10% and the

remaining 1 to 2% was banana powder. The banana powder could be considered as loss to some extent because as compared to figs (main product), the sale price of powder was half of the banana figs. The majority of processors of banana chips were of small-scale industry category. Negligible losses were found to occur at processors level as far as the raw material was concerned. Similarly, negligible losses were reported and observed during the processing of banana chips. While frying the chips in oil, some of the banana chips were discoloured or burnt which were removed from the final product. But, the amount of such losses was very little.

## REFERENCES

- Acharya, S.S. and Agrawal, N.L. 2001. *Agricultural Marketing in India*, Oxford and IBH Publishing Company, New Delhi
- Anonymous, 2005. Post harvest practices and loss assessment of some commercial horticultural crops of Assam. An article published by Directorate of Research (Agri.), Assam Agricultural University, Jorhat
- Filmore, E.B.; Larry, W.D. and Amihud, K. 1982. *Statistical Methods for Food and Agriculture*, AVI publishing Co., Westport, Connecticut
- Gajanana, T.M., Sreenivasa Murthy, D. and Sudha, M. 2002. Marketing and post-harvest loss assessment of banana var. Poovan in Tamil Nadu. *Agril. Econ. Res. Rev.*, **15**:56-65
- Kotecha, P.M. and Desai, B.B. 1995. Banana. In: *Handbook of Fruit Science and Technology : production, composition, storage and processing* (D. K. Salunkhe and S. S. Kadam, eds.), Marcel Dekker, Inc., New York. pp. 67-90
- Negi, J.P., Gupta, A.K., Singh, B. and Dagar, K.S. 2002. State-wise area, production and productivity of banana, Indian Horticulture Database – 2002, National Horticulture Board, Gurgaon, India, p. 42
- Sreenivasa Murthy, D., Gajanana, T.M. and Sudha, M. 2002. Post-harvest losses and marketing efficiency : a case study of banana in Karnataka. *The Bihar J Agri. Mktg.*, **10**:221-230

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