



Assessment of Fruit Management in Gondar town Markets of North Western Ethiopia

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Abstract

Fruits are highly perishable and affected by different microbial contaminants from production to consumption. The objective of this study was to evaluate fruit management from Gondar town market. The management of fruits was assessed through interview and observation regarding to handling practice, hygienic condition of fruit handlers, problems related to transportation and sanitary condition of the marketing places. Among 32 fruit venders interviewed, their gender, age and educational levels were quantified. Majority of the fruit venders were illiterate females aged ≤ 20 years. Most of the fruit venders were not aware of food born diseases through unhygienic fruits consumption. Majority of the respondents said that the transport system for fruits had sanitary problems but none of them washed fruits before selling. Loss of fruit due to spoilage and physically injury were common problems for all fruit venders. Evidence obtained from the observation about handling practices showed that all the fruit marketing areas were not functional only for fruits. Different commodities were processed in the shop. During the time of observation 62.5 % fruit marketing areas were saturated with dust and different dirty matter and fourteen of the handlers did not wear clean and appropriate cloths.

Key Words: Fruit management, Fruit venders, Hygienic condition, Contamination, Gondar.

1. Introduction

Fruits in different forms such as whole fruit, fruit juice, fruit pulp, and fruit concentrate have a vital role for health. They are dietary sources of nutrients, micronutrients and vitamins for human and are thus vital for health and well being. Well balanced diet rich in fruits are especially valuable for their ability to prevent deficiency diseases and are also reported to reduce the risk of several diseases (Angela *et al.*, 2010). For many countries fruit products have become valuable, making a substantial contribution to the economy as well as to the health of country population (Zeberga, 2010). Fruits contain vitamin C, foliate and dietary fibers and other bioactive components such as carotenoids and flavonoids which are suggested to be responsible for the prevention of degenerative diseases. Studies have shown that if fruits are consumed daily in sufficient amount, it could help to prevent major diseases such as cardio vascular and certain cancers (Jedah and Robenson, 2002). According to WHO (2002) report, low fruit and vegetable intake is estimated to cause about 31 % of heart disease and 11 % of stroke worldwide and around 2.7 million lives could potentially be saved each year if fruits and vegetable consumption was sufficiently increased.

Ethiopia's wide range of agro climatic conditions and soil types make it suitable for the production of diverse varieties of fruits including temperate, tropical and subtropical fruits. Pineapples, passion fruits, bananas, avocados, citrus fruits, mangoes, mandarin, papayas, guava, grapes, asparagus *etc.*, are produced in Ethiopia. Around 47 thousand hectare of land is under fruit production in Ethiopia. Banana contributed about 60.6 % of fruit areas followed by mango that contributed about 12.61 % of the area (CSA, 2008). Total fruit production in Ethiopia is about 500 thousand tones. Fruits have significant importance with a potential for domestic and export markets and industrial processing in Ethiopia. The main fruits produced and exported are banana, citrus fruits, mango, avocado, papaya and grape fruits (Zeberga, 2010). Growing and marketing of fresh fruit in Ethiopia are complicated by post harvest losses both in terms of quality and quantity between harvest and consumption. The quality of fresh fruit depends up on the harvesting activities, post harvest handling, transportation and storage (Haider and Demisse, 1999). Compared with other temperate fruits, tropical and subtropical fruits such as mango, banana, and papaya currently with great problem in storage and transportation because of their perishable nature (Baldwine and Mitra, 1997).

The production, marketing and consumption of mango, banana, avocado and papaya fruits are restricted due to improper handling, inadequate transport and storage facility, disease problems, and sensitivity to low storage temperature (Baldwin and Mitra, 1997). Even though Ethiopia is experiencing huge post harvest losses, very little emphasis has been laid on the post harvest handling (Tadesse, 1991). The recent joint FAO/WHO expert consultation on diet, nutrition and the prevention of chronic diseases, recommended the intake of a minimum of 400 grams of fruit and vegetable per day for the prevention of chronic diseases such as heart disease, cancer, diabetes and obesity as well as the prevention and alleviation of several micronutrient deficiencies (WHO, 2003). Apart from their nutritional values some tropical fruits are known to have therapeutic properties and are popularly used traditional medicines in several countries (APO, 2006). Fresh fruits recently have confined as a significant source of plant and human pathogens and chemical contaminants that pose a potential threat to human health worldwide and the contamination is special concern. Because it likely to be consumed raw without processing thus posing a potential food safety and type of microbiologically lethal processing thus passing a potential food safety problems (European Commission, 2002). Poor handling can damage fresh produce, rendering the product susceptible to the growth or survival of spoilage and pathogenic microorganisms. This damage can

also occur during harvesting, packing and transporting. The presence of cut and damaged surfaces provides an opportunity for contamination and growth of microorganisms and enters into plant tissues (Francis *et al.*, 1999).

In Gondar town fruits such as citrus fruits, banana, mango and avocado are common supplementary diets. Especially orange and banana are available in the market throughout the year while the others are often seasonal. The town markets obtain fruits from different governmental and private farm lands that cross many hundreds of kilometers (Personal communication with fruit distributors). During the process such as harvesting, storing, packing and transporting the fruits encounter physical injury that increase post harvesting loss and the possibility of microbial contamination. In addition, the problem can be enhanced from poor management of fruits in the market. Market conditions that favor contamination can be raised from poor hygiene of the venders, using microbial unsafe container poor handling practice and poor environmental conditions such as sanitarly unsafe marketing environment. The consequence of the problems is increasing loss of fruit due to microbial spoilage and the existence of some human pathogens (Abadias, *et al.*, 2008). Fruit safety has emerged as an important global issue with international trade and public health implication. In response to the increasing food borne illness, governments all over the world are intensifying their effort to improve fruit safety (Sudershan, *et al.*, 2009). However in Ethiopia no sufficient continuous survey or assessment of fruit safety has been developed. The researcher has been motivated to fill the gap. Therefore, this study has tried to determine the management of fruits in Gondar town.

2. Material and Methods

2.1. Study area

Gondar is located in the north western Ethiopia at a latitude of $12^{\circ} 36' N$, and longitude of $37^{\circ} 28' E$ with an average elevation of 2080 m. a. s. l. Gondar town is located in the west of Northern Gondar administrative zone which is 747 Km far from Addis Ababa in the North West direction (Figure 1). Based on the 2005 census the total population of Gondar is 194,773 (97,625 males and 97,148 females). Gondar has mid altitude climate and an average annual max temperature of $27^{\circ} C$ and minimum temperature of $16^{\circ} C$. This town administration has twenty three urban and 11 rural kebeles (Source: Gondar Statistics office).

2.2. Study design and sampling

A cross sectional and descriptive survey design were undertaken from the middle of December 2011 to May 2012 to evaluate the management of fruits at Gondar town. Within the available resources all the main fruit shops from Gondar fruit marketing area was selected for the interview and observation purpose. Information gathered on sanitary condition of the shops, the hygienic condition of the fruit venders and their handling practices by using check list. In addition the handling practices of the people who were engaged for transportation of fruits also examined.

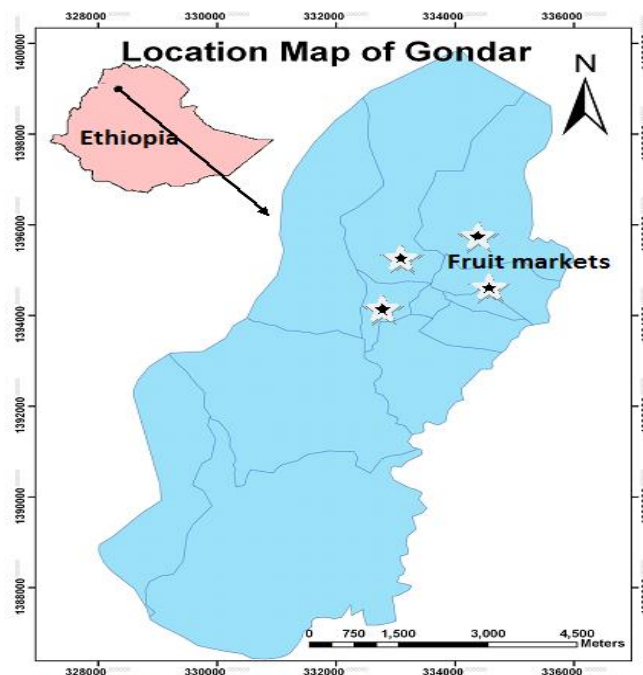


Figure 1. Map of the study area

3. Results

3.1. Socio demographic characteristics of fruit venders

Among 32 fruit venders interviewed, their gender, age and educational levels were quantified. In gender category 6 of them males and rest of them females. It shows the females were involved much in fruit vending. Among the age groups of the fruit venders, the maximum of 12 members were ≤ 20 years of age followed by 21 to 30 years and 31 to 40 years of age and the minimum of 2 venders belongs to ≥ 41 years of age. The level of education varies among the gender and age categories, 17 of them were illiterates, 6 of them passed elementary and high school level in each. Only 3 of them completed higher than high school level of education as given in table 1.

Table1. Socio demographic characteristics of the fruit vendors in Gondar town fruit market area.

Socio demographic characteristics of fruit vendors		Frequency	Percentage (%)
Gender	Male	6	18.00
	Female	26	82.00
Age	≤ 20	12	37.50
	21-30	10	31.25
	31-40	8	25.00
	≥41	2	6.25
Level of education	Illiterates	17	53.12
	Elementary level	6	18.75
	High school level	6	18.75
	Above high school level	3	9.38

3.2. Awareness of fruit vendors on contamination of fruit

Response regarding to knowledge about fruit contamination are shown in table 2. The majority of fruit vendors were not aware of whether fruits are cause of food born disease or not. Twenty six (81.25%) of fruit vendors were responded the option I do not know. Twenty four (75 %) of the respondents were not aware about the spoilage of fruits by microorganisms. In addition twenty two (68.75%) were unaware about the effect of spoilage fruits on healthy fruits. Seventeen (53.13 %) of the respondent did not know about cross contamination of fruits.

Table 2. Awareness of fruit vendors on contamination of fruits.

Interview statement	Response (percentage)		
	Yes	No	I do not know
Can fruits cause food born disease?	4 (12.50 %)	2 (6.25%)	26 (81.25%)
Can microorganisms spoil fruits?	8 (25.00%)	8 (25.00%)	16 (50.00%)
Can micro organisms transferred from spoiled fruits to healthy fruits?	10 (31.25%)	10 (31.25%)	12 (37.50%)
Can microorganisms transfer from different commodities to fruits?	15 (46.88%)	8 (25.00%)	9 (28.12%)

3.3. Improper handling of fruits during transportation

Among the interviewed twenty (62.5 %) of them responded that the transport system for fruits had sanitary problems such as it is dusty, fruits not packed and transported with other commodities. More than twenty eight (87.5 %) of the respondents received unpacked fruits except banana. Twenty nine (90.6 %) of the respondents received dusty fruits and none of them washed it before selling. All the respondents always receive physically injured and spoiled fruits with healthy fruits. Sixteen (50 %) of the respondents always received physically injured fruits from the distributors. In addition 25 (78.1 %) of them received both physically healthy and spoiled fruits in the same container (Table 3).

Table 3. Interview results related to fruit transportation.

Interview statements	Response (percent)		
	Always	Sometimes	Never
Have you ever received muddy and dusty fruits from the distributors?	29 (90.63%)	3 (9.37%)	-
Have you ever received physically injured fruits from the distributors?	16 (50.00%)	12 (37.50%)	4 (12.50%)
Have you ever received both spoiled and healthy fruits in the same container from the distributors?	25 (78.13%)	7 (21.87%)	-
Have you ever received fruits in packed form?	28 (87.50%)	4 (12.50%)	-

3.4. Problems related to marketing area

The interview result indicated that in the twenty one (65.6 %) of fruit shops, fruits stored for 3 to 6 days, however in seven (21.9 %) of fruit shops fruits stored for 2 to 4 days. Among the shops only ten (31.3 %) of them stores physically injured and spoiled fruits separately and rest of them not store separately. Twenty seven (84.4 %) of the vendors responded that their clients always touch fruits by their hands for sorting. Majority of fruit vendors 26 (81.3 %) used the beam balance for weighting other commodities (Table 4).

Table 4. Interview result about problems related to marketing area/shop.

Interview statements	Responses (%)		
	Always	Some times	Never
Have you ever washed fruits before selling?	-	-	32 (100.00%)
Is fruit loss due to spoilage and physical injury a problem to you?	-	-	32 (100.00%)
Have you stored injured fruits spoiled fruits and healthy fruits separately?	10(31.25%)	8(25.00%)	14 (43.75%)
Do other people touch by hand for sorting during marketing?	27 (84.38%)	5(15.62%)	-
Do you use the measuring balance for other commodities also?	17 (53.13%)	9(28.12 %)	6 (18.75%)

3.5. Handling practices by venders in the market

Evidence obtained from the observation about handling practices showed that all the fruit marketing areas were not functional only for fruits. Different commodities were processed in the shop. In eighteen (56.3 %) of the fruit marketing shops different fruits were placed together in the same container. Fourteen (43.8 %) were stored different fruits in different container. Twenty (62.5 %) venders placed spoiled and healthy fruits together. None of the fruit venders used refrigerator. All fruits were placed at room temperature. None of them used protective plastic to protect from dust and other contaminants.

3.6. Sanitary condition of the market

During the time of observation twenty one (65.6%) of the marketing area free from pests. Around twenty (62.5 %) fruit marketing areas were saturated with dust and different dirty matter. Around 12 (37.5 %) fruit marketing areas there was toilet room. Different pests could inoculate different microorganisms to the fruit. About 24 (75 %) of fruit shops had no waste collection bin. Sixteen (50 %) of marketing areas were contaminated by horse and donkey dung (Table 5).

Table 5. Observation result about the sanitary condition of the markets.

Observation statement	Yes	No
	Frequency (%)	Frequency (%)
Is the area and the shop free from pests	21(65.62%)	11(34.38 %)
Is the marketing area free from dust	12 (37.50%)	20 (62.50%)
Is there waste collecting bin?	10(31.25 %)	22(68.75 %)
Is there toilet room around the marketing area	9 (28.13 %)	23(71.87%)
Is the area free from horse, donkey or other animal dung or wastes?	16(50.00 %)	16 (50.00%)

3.7. Hygienic practices of fruit handlers

Food handlers can introduce microbial pathogens to the fruit directly from their hands and clothing or by contaminating equipment and materials that come into contact with the fruit. From the study eighteen (56.3 %) of the fruit handlers wear clean clothes while fourteen (43.8 %) of the handlers did not wear clean and appropriate cloths. Their clothes adsorbed dust, oil and other dirty matter. Twenty two (68.8 %) of fruit handlers had short trimmed nails. None of them had visible skin rash, cut or wound at the time of visit. In addition 27 (84.4 %) of the fruit handlers had no hair nits at the time of observation (Table 6).

Table 6. Observation result for the hygienic practices of fruit handlers.

Observation statement		Yes	No
		Frequency (%)	Frequency (%)
1	Do the fruit handlers nails are short and clean?	22 (68.75%)	10 (31.25 %)
2	Do the fruit handlers wear clean and appropriate cloth?	18 (56.25%)	14 (43.75 %)
3	Do the fruit handlers wear hair nits?	5 (15.63%)	27 (84.37%)
4	Is there any kind of visible skin rash, cut and wound observed at the time of visit?	-	32 (100.00%)

4. Discussion

The results indicated that majority of the fruit venders were with inadequate knowledge about whether fruits are cause of food born disease, cause of spoilage, the effect of spoiled fruits on the health fruits and cross contamination of fruits. This might be due to the educational background and lack of information. Vehicles and containers used to transport fruits and vegetables could be a source of potential contamination. They should be clean as part of Good Hygienic Practices (GHP) to prevent contamination (Jennylynd, 2006). The problem can impose an effect in the marketing process. The manner of transport is one the factors that contributes to the contamination and the room temperature is conducive environment that contributes the presence of contaminating flora (NACMF, 1999).

Hence the fruit vendors always receive spoiled and injured fruits; there may be transfer of spoilage microorganisms to the healthy fruits. In addition opportunistic microorganisms have a chance to be inoculated into the internal part of fruits. Majority of fruit vendors used the beam balance for weighting other commodities. This practice could expose fruits for cross contamination either from one fruit to the other or from other commodities to fruits. All fruit vendors had a problem of using measuring balance. The measuring balance was not clean, they used it for measuring different commodities, and they did not use polyethylene bag on the surface of the tray during weighting or measuring. This practice could favor cross contamination of fruits. All the vendors could not use glove while they were touching and measuring fruits. This favors the transfer of microorganisms from their hands to the fruits. From the observation majority of fruit shops had no waste collection bin. Because of this different spoiled fruits and their peels were put randomly around the marketing area. The condition can attract different pests that can inoculate microorganisms from the waste to the health fruit.

In all fruit marketing areas there were inadequacies regarding to handling practice especially in storage conditions, using measuring balance and manipulating of fruits. Animal dung are the main reservoir for many pathogenic microorganisms such as *Salmonella*, *Shigella*, *Listeria* and *E. coli* (FDA, 2002). So the chance for contamination in such area could be high. Handling without hair nits could favor the contamination of fruit due to the transfer of microorganisms from their hair to fruits through their hands (Jennylynd, 2006).

5. Conclusion

From the assessment of fruit management a number of deficiencies were identified in the study area. Fruit vendors were unaware of the health risk of fruits contamination. Poor handling practice during storage, measuring or weighting, loading and unloading from the vehicles, unable to use waste collection bin were also identified as deficiencies in most of the shops. In addition, the sanitary deficiency was identified from fruit marketing areas that can increase the probability of fruit contamination. The responsibility to safeguard fruits from contamination is shared by everyone involved from the grower to the consumer. Education and knowledge are tools to improve fruit safety controls. So training the fruit handlers such as fruit vendors or sellers and workers engaged for loading and unloading fruits from the vehicles about fruit born diseases, contamination of fruits, handling of fruits and the impact of hygienic problems on the safety of fruits is essential to reduce the contribution of the fruit handlers for contamination in the study area. Supervising and monitoring system on the sanitary condition of fruit marketing areas and the feasibility of transport system should be introduced. Further studies should be conducted on the areas such as the necessary alternative decontamination methods of fruits and the economical impact of fruit loss.

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