



## Bacteriological Assessment of Avocado Juice Vended in Cafeteria And Restaurants in Adigrat Town, Northern Ethiopia

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**Abstract:** Fresh fruit juices are essential component of the human diet and there was considerable evidence of health and nutritional benefits associated with the consumption of fruit juice. The objective of this study was intended to assess the bacteriological load of fruit juice vended in Adigrat town. A cross sectional study design was conducted from March 2006 to June 2006. A total of ten samples were collected from ten randomly selected cafes or restaurant in Adigrat town and analyzed for bacteriological quality. The sample were appropriately diluted and incubated on Nutrient Agar to determine Aerobic Mesophilic Bacteria count; Violet Red Bile Agar (VRBA) to determine the Total coliform Count, Mannitol Salt Agar to determine Total Staphylococcus count; MacConkey Agar to determine Entrobacteriaceae count. The mean of Total coliform count was  $4.7 \times 10^1$  cfu/ml; Staphylococcus count was  $3.78 \times 10^1$  cfu/ml; Aerobic Mesophilic bacteria count was  $1.183 \times 10^2$  cfu/ml and Entrobacteriaceae count was  $2.04 \times 10^1$  cfu/ml. Due to unhygienic fruit handling and unsanitary environmental conditions, the juice product were contaminated with harmful bacteria such as AMB, TCC, EBC and SC. The result of this study was confirmed that there was unhygienic condition during household preparation of fruit juices which is probably due of poor personal hygiene, mishandling of utensil used, contaminated water and poor environmental conditions. Therefore, regular supervision and training society about how to processing and handling of fruit juices safely and hygienic conditions were improve the quality of fresh fruit juices in the study area.

**Keywords:** Prevalence, Bacteriology, Fresh Juice, Ethiopia.

### I. INTRODUCTION

Fruit juices are nutritious drinks with great taste and health benefits (Svaad and Eman, 2008). In many tropical countries there are common fresh fruit juices are essential components of the human diet and there is considerable evidence of the health and nutritional benefit associated with the consumption of fresh fruit or their juices (Shakir et al., 2009). The consumption of fruit juice could have both positive and negative effect on the part of consumer. Fruit juices processed under hygienic conditions could play important role in enhancing consumers health through inhibition of breast cancer, congestive heart failure (CHF),

and urinary tract infection (Dennison, 1996). In absence of good manufacturing practice, the nutritional richness of fruit juices makes the product good medium for microbial growth and vehicle of food borne pathogens and associated complication (Al-jedah and Robinson, 2001). There are several reports of illness due to the food borne diseases associated with the consumption of fruit juice at several place around the world (Mosupye and Holy, 2000; Muinde and Kuria, 2005; Chumber et al., 2007). Several factors can act as source of contamination such as use of unhygienic water for dilution, dressing with ice, prolonged preservation wit out refrigeration, unhygienic surroundings often with swarming house flies and fruit flies and air born dust. Fruit juices have been shown to harbor bacterial pathogens such as, Escherichia coli, Salmonella species, Shigella species and Staphylococcus aureus (Buchmann et al., 1999; Sand deep et al., 2004; Barro et al., 2006).

Food borne or water borne microbial pathogens are leading causes of illnesses in developing countries, killing an estimated 1.9 million people annually at the global level. Even in developed countries an estimated one-third of the population is affected by micro biological food borne diseases each year (Andarrgie et al., 2008). There are reports of food borne illness associated with the consumption of fruit juices at several place in India and elsewhere (Parish, 1997; Health Canada, 2000; Sand deep et al., 2001). In Ethiopia, particularly in large urban areas, fruit juice is available in super markets in canned or bottled forms. In addition, fruit juice vending houses, which have been serving different types of fruit juices in fresh forms, are proliferating (Tsige et al., 2008). Most of the fruit juices being in jimmy had high microbial load so that these products could be cause of health problems and potential vehicles of food borne out break (Ketema et al., 2008). Contamination of fruit juice sold in restaurants, cafes and even road side stalls are sometimes un acceptable for human consumption and create significance health problems (Lewis et al., 2006). However, there was no any study in relation to the safety of fruit juices prepared and consumed in study area. Therefore, the objective of this study was intended to assess the bacteriological load of fruit juice vended in Adigrat Town.

**II. MATERIAL AND METHOD**

**A Description of Study Area**

The study was conducted in Adigrat town from March 2006 to June 2006. Adigrat town is found in Eastern Zone of Tigray about 894 km from Addis Ababa the capital city of Ethiopia and 114 km far apart from Mekelle city of Tigray regional state respectively located at 14 16N latitude and 39 E longitude with an elevation of 2457 meter above sea level. It's mean annual rain fall ranges from 400-600mm. Most of the annual rain fall of the study area is started from June up to end of August and the average temperature is ranging from 15 to 27.5c.

**B. Study Design**

A cross-sectional study design was conducted from March 2006 up to June 2006 to evaluate the bacteriological profile of fruit juice sold in Adigrat town.

**C. Collection of Samples**

From each kebel's cafeteria or restaurants which are known to vending fruit juices was purposively selected for sample collection from March 2006 to June 2006 .The maximum types of fruit juices sold in the study area were drawn for laboratory studies. 250ml of Fruit juice were collected in a sterile flask and transported to Adigrat University, Biology Department by using ice box.

**D. Sample Processing Method**

25ml of fruit juice were separately drawn and blended in 225ml of physiological saline solutions (0.85%Nacl).The sample were homogenized and appropriate dilutions ( $10^{-3}$ ) were performed. Appropriate dilution series ( $10^{-3}$ ) of the sample were plated in duplicate on the pre-dried surface of respective media for bacteriological count. The actual numbers of bacteriological colony count were estimated as colony forming unit per ml (CFU/ml).

**E. Bacteriological analysis**

**Enumeration of Aerobic Mesophilic Bacteria (AMB):**

From each samples of previously prepared serial dilution; One ml of the sample were transferred in to sterile petridishes and 20ml of Plate count Agar (PCA) medium (Oxoid company) previously sterile which was kept in water path at  $45C^0$  were poured and swirled and finally incubated. Aerobic Mesophilic Bacteria (AMB) was counted on Plate Count Agar (PCA) after incubation at  $37^0C$  for 24 - 48 hours.

**Enumeration of Total Coliforms Count (TCC):**

From each samples of previously prepared serial dilution; One ml of samples were transferred in to sterile petridishes and 20 ml of Violet Red Bile Agar (VRBA) medium(Oxoid company) previously sterile which was kept in water path at  $45C^0$  were poured and swirled and finally incubated at  $37C^0$  for 24-48 hours. Purple-red colonies that surrounded by zone of precipitated bile acids were counted using digital colony counter.

**Enumeration of Staphylococcal Count (SCC):**

From each samples of previously prepared serial dilution; 1ml of the sample transferred in to sterile petri dishes and 20 ml of

Mannitol salt agar(MSA) medium (Oxoid company) previously sterile and kept in to water path at  $45c0$  were poured and swirled and finally incubated at  $37c0$  for 24-48 hours. Yellow and orange colonies surrounded by yellow zones due to mannitol fermentation are enumerated as total staphylococcus count.

**Enumeration of Enterobactericea Count (EC):**

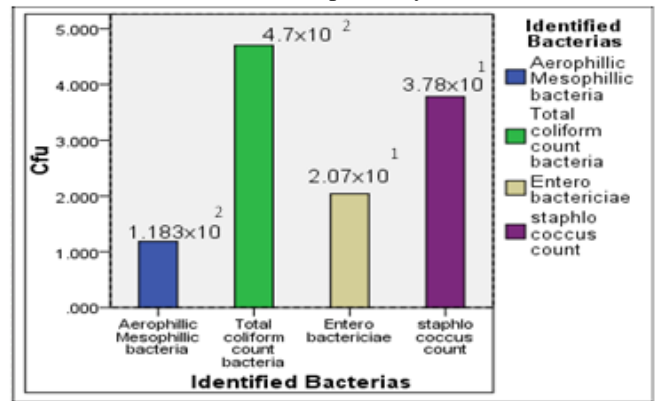
Similarly, from previously prepared serial dilution; One ml of the sample was transferred in to sterile petridishes and 20ml of MacConkey Agar (MacA) previously sterile and kept in to water path at  $45c0$  were poured and swirled and finally incubated at  $37C0$  for 24-48 hrs. Red – Pink colonies due to bile fermentation were enumerated/counted as Enterobactericeae.

**F. Data Analysis**

The collected data was recorded, organized and entered into micro soft excel and summarized in different sample descriptive statistic such as percentage, mean and finally presented by using tables.

**III. RESULTS**

A total of ten Avocado juice samples were examined for bacteriological quality in Adigrat town and their bacteriological profile was shown in the Fig.1. In this study, different bacteria were isolated such as Aerobic Mesophilic Bacteria, Total Coliform count, Entrobactericeae count and Staphylococcus count was obtained from Plate Count Agar, Violet Red Bile Agar, MacConkey Agar and Mannitol Salt Agar respectively. The mean count of Total Coliform count was the highest ( $4.7 \times 10^1$  cfu/ml) in avocado juice. The mean count of Aerobic Mesophilic Bacteria, Entrobactericeae count and Staphylococcus count were  $1.183 \times 10^2$  cfu/ml,  $2.04 \times 10^2$  cfu/ml and  $3.78 \times 10^1$  cfu/ml respectively.



**Fig.1. Isolated Bacteria from Avocado Juice in Adigrat Town.**

**IV. DISCUSSION**

According to the current study, the investigated fresh fruit juices samples were shown high microbial load. Different types of bacteria species were isolated from Avocado juice sold in Adigrat town i.e. Aerobic Mesophilic Bacteria ( $1.183 \times 10^2$  CFU/ml) was obtained from the Nutrient Agar; Total Coliform Count ( $4.7 \times 10^1$  CFU/ml) was obtained from Violet Red Bile Agar; Entrobactericeae ( $2.04 \times 10^1$  CFU/ml) was also obtained from MacConkey Agar and

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Staphylococcus count ( $3.78 \times 10^1$  CFU/ml) was obtained from Mannitol Salt Agar. The bacterial count recorded from the Avocado juices analyzed in this study ranges between ( $1.183 \times 10^2$  cfu/ml up to  $4.7 \times 10^1$  CFU/ml) which was relatively lower than the bacteriological load reported in earlier work (Latef et al., 2004). To the researcher's knowledge, there is no specification set for the permissible level of bacteria in Avocado juices being served in Ethiopia. However, the recommended specification for fruit juices being served in the Gulf region suggests that the maximum count permitted for Total colony count were  $1 \times 10^4$  CFU/ml (Gulf standard, 2000). On the basis of the Gulf standards, it is clear that the bacteriological load in studied samples were exceeded the standard.

Total coliform count was the highest bacteria count encountered in fresh Avocado juice vended in the study area. This was possibly due to contaminated water used during the course of processing (i.e. mostly water served for washing and dilution purpose) which in line with study reported by Koalil et al. (1994) stated that one of the major sources of contamination of fruit juice was water utilized for washing and processing purpose. The presence of Enterobacteriaceae count in fruit juices has been attributed to their being natural flora of the fruit which may be introduced into the juices under improper operated processes (Frazier and Westhoff, 1998). The occurrence of Staphylococcus count encountered in Avocado juice sample were contributed through mishandling of the juice and utensils being used during the course of processing. This may be due to poor personal and domestic hygiene which indicating lack of basic knowledge of hygienic practice and safety of food products (Tambekor, et al., 2009). Moreover, the presence of Aerobic Mesophilic Bacteria was due to several factors such as improper handling and processing, use of contaminated water during washing and dilution purpose, the use of dirty processing utensils like knife and trays (Koalil et al., 1994).

## V. CONCLUSION AND RECOMMENDATION

### A. Conclusion

This study indicates that all samples of Avocado juices examined were contaminated with different bacteria species which might be due to poor hygienic condition related to washing of utensils, use of contaminated water and poor personal and domestic hygiene.

### B. Recommendation

Based on the current finding, the following points are forwarded:

- The concerned body should scale up the good awareness of the society regarding food safety and hygienic practice.
- The contamination of fresh fruit juice should be reduced by setting and implementing the standard hygienic protocol, for each fruit juice, use of good quality raw material.
- Regular monitoring of the quality of fresh fruit juice for human consumptions must be performed to avoid any future outbreak of bacterial food born disease.

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