



Evaluation of Microbial Quality of Street Vended Vegetable and Fruit Juices

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Abstract

Millions of people throughout the world consume fresh juices sold by street vendors as they are rich source of nutrients such as vitamins and minerals. They cause a great health problem in unhygienic conditions. There are reports of food borne illness associated with the consumption of street vended juices throughout the world and at several places in India. The present study was undertaken to evaluate the quality of juices sold by street vendors in Guntur, A.P., India. Two types of vegetable juices namely beetroot and carrot; three types of fruit juices namely mousambi, grapes and pineapple were selected based on the consumers demand. The juices are collected from five different localities viz., Brundavan Gardens, Sankar vilas, RTC Bus terminus, Kothapet and Nazz center. TVC (Total Viable Count), coliforms and yeast counts were analysed using standard methods like serial dilution and plate count. The results showed that TVC was highest in carrot juice followed by beetroot, pineapple, grape and mousambi juices respectively. TVC count ranged from 87-250 ($\times 10^5$ CFU/ml) in beetroot juice; 80-271 in carrot juice; 15-150 in mousambi juice; 19-184 in grape juice and 25-217 in pineapple juice. The coliform count ranged from 8-66 ($\times 10^5$ CFU/ml) in beetroot juice; 1-54 in carrot juice; 0-73 in mousambi juice; 1-10 in grape juice and 1-63 in pineapple juice respectively. However, the coliform count was highest in mousambi juice followed by beetroot, pineapple, carrot and grape juices. The yeast count ranged from 11-106 ($\times 10^5$ CFU/ml) in beetroot juice; 5-41 in carrot juice; 1-53 in mousambi juice, 3-20 in grape juice and 7-126 in pineapple juice respectively. The yeast count was highest in pineapple juice followed by beetroot, mousambi, carrot, and grape juice respectively. It is concluded that imparting training to the street vendors and creating awareness regarding good manufacturing practices (GMP) and good hygienic practices (GHP), implementation of standard hygienic practices and regular monitoring of the quality of fruit juices must be introduced to avoid frequent pathogen outbreaks.

Keywords: Juices, quality, contamination, microbes, TVC, coliforms, yeasts.

Introduction

Fruit juices are the unfermented but fermentable liquid obtained from the edible part of mature and fresh fruits or fruits maintained in fresh condition by physical means or other suitable treatments¹. Juices are prepared mechanically by squeezing or macerating the pulp of fresh fruits or vegetables without application of heat or solvent to give an unfermented clouded, unclarified and untreated juice ready for consumption². Diluting or blending is a common practice as many fresh juices are either too acidic or too strongly flavored to be pleasant for consumption¹.

Fresh fruit and vegetable juices are an important part of modern day diet in many parts of the world as they are rich source of nutrients such as vitamins, minerals and other naturally occurring phytochemicals which are of health and therapeutic benefits².

In hot climate areas, cafes, restaurants and subway stalls have local facilities to extract juices from fresh fruits and serving the juice dozed with ice to the thirsty customer³. The fresh juices sold by street vendors are preferred by consumers because of their taste, flavor, low price and availability at the right time⁴.

However, freshly extracted juices may not always be safe owing to the heavy load of microbes⁵. Safe food consumption standards won't allow presence of coliforms in fruit juices⁶. Major ingredients of juices such as water, sugar, natural fruit pulp etc., may also carry some microbial contaminants⁷ which may cause spoilage of drinks or gastrointestinal disorders to consumers⁶. Food borne illness associated with the consumption of fruit juices at several places in India and elsewhere are reported⁸⁻¹². Microbial safety studies of some fruit juices showed *Salmonella* in apple and orange juices¹³ and *E.coli* O157:H7 in apple juices¹⁴.

Burnett and Beuchal¹⁵ identified *E.coli* O157:H7., *Salmonella* spp. and *Cryptosporidium* as prominent pathogens in unpasteurized juice outbreaks. Similarly, Mosupye and Holy Von¹⁶ found that in Pune city, India a cholera epidemic was related to street vended sugarcane juice containing ice contaminated with *Vibrio cholera*.

The scientific information on the quality and safety of vegetable and fruit juices prepared and sold by street vendors in Guntur city is scanty. Therefore, the present study was undertaken to evaluate the quality and safety of vegetable and fruit juices sold by street vendors in Guntur city.

Material and Methods

Collection and Analysis of vegetable and fruit juices: Two types of vegetable juices namely beetroot and carrot; and three types of fruit juices namely mousambi, grape and pineapple are chosen for testing the quality of juices based on the consumer demand. About 150 ml of each juice sample are collected for three times during last week of April to last week of May, 2013 around 10.30 A.M when the demand and consumption is high due to hot and dry weather conditions. These samples are collected from different localities of Guntur viz., Brundavan Gardens, Sankar vilas, RTC Bus terminus, Kothapet and Nazz Center in sterile polythene bags, transported to the laboratory in an ice box and refrigerated until further analysis. The samples are analysed for microbial count such as Total Viable Count (TVC), coliform bacteria and yeast within one hour of collection.

Microbial analysis of the vegetable and fruit juice samples: For analyzing the microbial count, one ml of each juice sample was diluted ten times with sterile distilled water. Serial dilution and plate count methods were adopted on appropriate selective media viz., nutrient agar for Total Viable Count (TVC), Eosine Methylene Blue agar (EMB) for coliforms and Yeast Extract-Dextrose Peptone agar (YEDP) for yeasts. From the diluted sample, 0.1 ml was inoculated on to 20 ml of the above mentioned media and incubated at 37°C for 24 h. After 24 h of incubation, the colonies were observed and counted. Replicate plates were maintained and the average of the colonies was taken. The mean number of colonies counted was expressed as colony forming units (CFU)/ ml.

Five ml of each juice sample was used for pH measurement using Digital pH meter.

Results and Discussion

The Total Viable Count (TVC) of freshly prepared vegetable and fruit juice samples collected from different locations of Guntur city ($\times 10^5$ CFU/ml) is represented in figure-1. It is observed from the figure-1, that TVC ranged from 87-250 in beetroot juice; 80-271 in carrot juice; 15- 150 in mousambi juice; 19-184 in grape juice and 25-217 in pineapple juice. TVC was highest in carrot juice followed by beetroot, pineapple, grape and mousambi juice respectively. Similarly, high microbial loads and TVC was found in carrot juice¹⁴; in carrot and pineapple juices² and in pineapple juice¹⁷. Sunday, Nyaudoh and Etido² also reported higher microbial count in vegetable juices than in fruit juices.

It was also observed that the TVC count was highest in all juices collected from RTC bus terminus which possibly is due to the contamination from raw materials and equipment, improper handling, prevalence of unhygienic conditions^{1,18}.

The coliform count of freshly prepared vegetable and fruit juice samples collected from different locations of Guntur city are represented in $\times 10^5$ CFU/ml ranged from 8-66 in beetroot juice; 1-54 in carrot juice; 0-73 in mousambi juice; 1-10 in grape juice and 1-63 in pineapple juice respectively. However, the coliform count among the juices was highest in mousambi juice followed by beetroot, pineapple, carrot and grape juices as shown in figure-2. The coliform count was highest in RTC bus terminus for beetroot and pineapple juice; in Brundavan Gardens for mousambi and carrot juices.

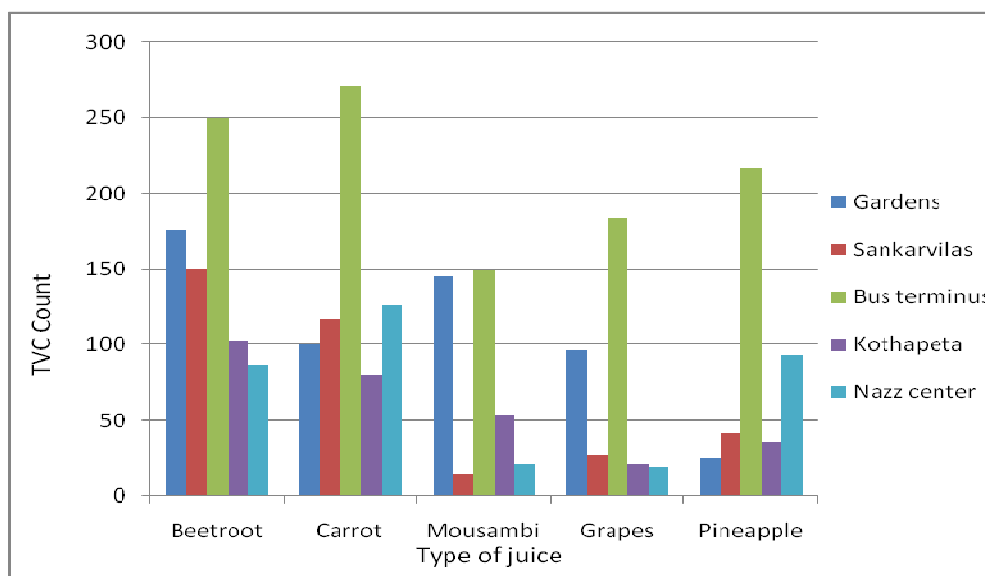


Figure-1

Total Viable Count (TVC) of freshly prepared vegetable and fruit juice samples collected from different locations of Guntur city ($\times 10^5$ CFU/ml)

The yeast count of freshly prepared vegetable and fruit juice samples collected from different locations of Guntur city represented in $\times 10^5$ CFU/ml ranged from 11-106 in beetroot juice; 5-41 in carrot juice; 1-53 in mousambi juice; 3-20 in grape juice and 7-126 in pineapple juice respectively. The yeast

count was highest in pineapple juice followed by beetroot, mousambi, carrot, and grape juice respectively as observed from figure-3. Similarly high yeast counts were detected in pineapple juice¹⁹. The yeast count was highest in RTC bus terminus for pineapple juice and in beetroot juice in Sankar vilas.

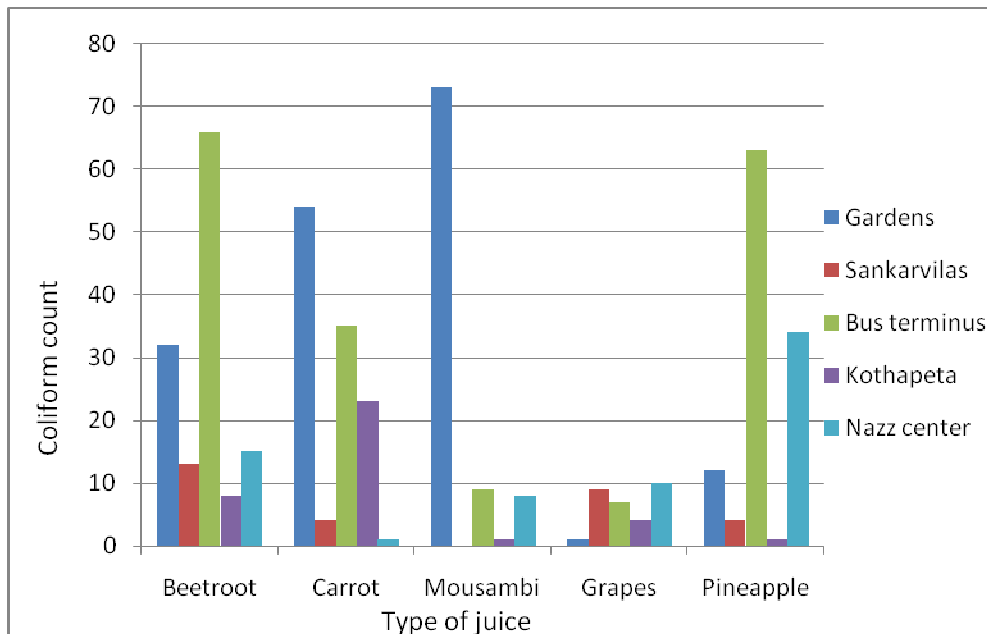


Figure-2
 Coliform count of freshly prepared vegetable and fruit juice samples collected from different locations of Guntur ($\times 10^5$ CFU/ml)

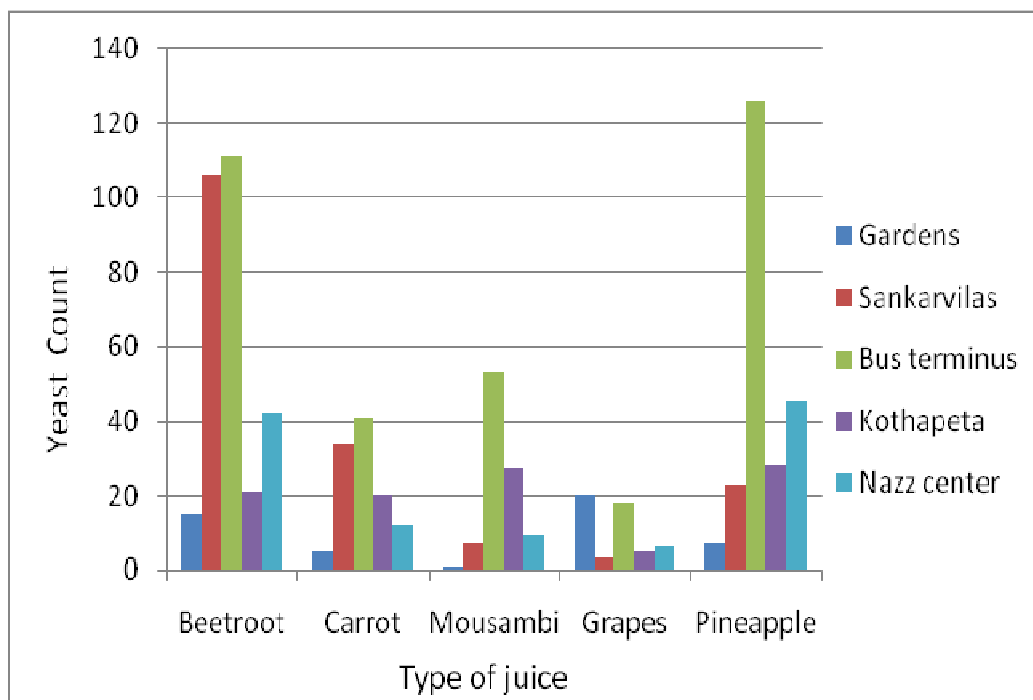


Figure-3
 Yeast count of freshly prepared vegetable and fruit juice samples collected from different locations of Guntur ($\times 10^5$ CFU/ml)

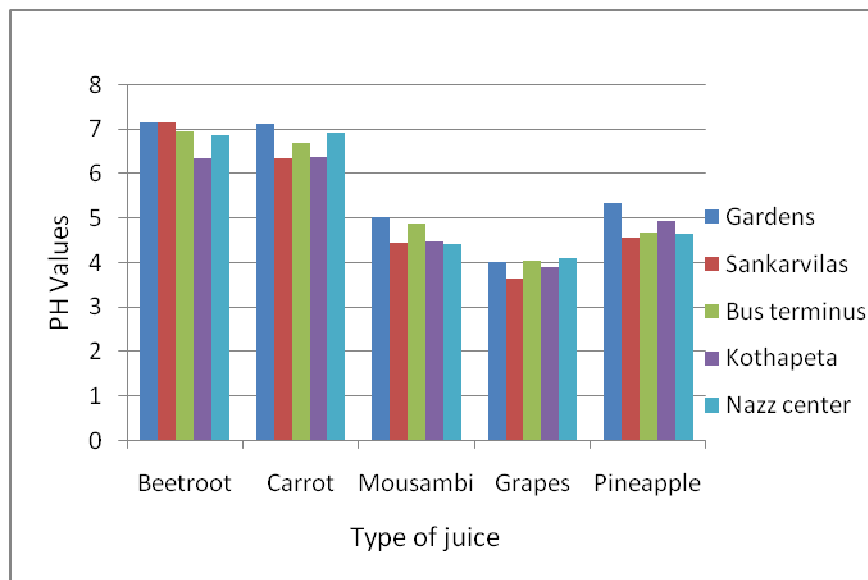


Figure-4
pH of freshly prepared vegetable and fruit juices collected from different locations of Guntur

The pH values of freshly prepared vegetable and fruit juice samples are represented in figure-4. It is observed that the pH values are almost near to neutral or just above neutral for vegetable juices i.e., beetroot and carrot juices and they are acidic for mousambi, grape and pineapple juices. Similarly, Sunday, Nyaudoh and Etido² determined pH values of carrot and pineapple juices.

It may be concluded that the high loads of microbial count may be due to various factors like poor quality of water used for dilution, preparation of ice²⁰, unhygienic conditions related to washing of utensils and maintenance of premises, poor personal and domestic hygiene, peeling of fruits before hand, shop in crowded place and dust particles in the evening²¹, unhygienic water² and lack of good hygiene practices²². The location by the side of a busy road with heavy vehicular traffic (airborne particles including dust) or by the side of the waste disposal system and overcrowding seems to add to the contamination¹⁸.

Conclusion

The present investigation was undertaken to evaluate the safety parameters of street vended vegetable and fruit juices sold in different localities of Guntur city. It was found that Total Viable Count (TVC) was highest in carrot juice followed by beetroot, pineapple, grapes and mousambi juices respectively. It was also observed that the TVC count was highest in all juices collected from RTC bus terminus. The coliform count among the juices was highest in mousambi juice followed by beetroot, pineapple, carrot and grape juices. However, the highest coliform count varied for juices in different localities. The coliform count was highest in RTC bus terminus for beetroot and pineapple juice; in Brundavan Gardens for mousambi and carrot juices. The yeast count was highest in pineapple juice followed by beetroot,

mousambi, carrot, and grape juice respectively. The yeast count was highest in RTC bus terminus for pineapple juice and in beetroot juice in Sankar vilas. It is concluded that imparting training and awareness to the street vendors regarding good manufacturing practices (GMP) and good hygienic practices (GHP), implementation of standard hygienic practices and regular monitoring of the quality of fruit juices must be introduced to avoid any future pathogen outbreaks.

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