



MICROBIOLOGICAL ANALYSIS OF STREET VENDED SUGARCANE JUICE IN NOIDA CITY, INDIA

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ABSTRACT

The outbreaks of human infections and diseases have been found in street vended contaminated fruit juices. So, there is a need to analyze the microbiological quality and safety of street vended juices for human consumption. The objective of this study was to analyze the microbiological quality of street vended sugarcane juice sold in Noida city, India. Total 40 samples of freshly extracted sugarcane juice from Noida city were collected and studied during the months of June 2013 to August 2013. The results indicated the pH of the collected samples in acidic range. MPN of samples (total coliforms) range from 9.4 MPN per 100 ml to >2400 MPN per 100 ml. Spread plate technique on standard agar showed the presence of *Pseudomonas aeruginosa* (25%), *Salmonella* spp (57.5%), *Klebsiella* spp (90%), *S. aureus* (82.5%) and *Escherichia coli* (72.5%) in the juice samples mainly due to unhygienic practices followed by the street vendors implying the immediate need of monitoring so as to improve microbial quality of juices.

KEYWORDS: *Sugarcane juice, Street vendors, Noida city, Microorganisms, Diseases*



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INTRODUCTION

Fruit juices are sold at all public places and roadside shops because of their nutritive value and are common man's beverages in many tropical countries. Most of these juices are sold by street vendors and are consumed by a large section of population of all income and age groups.¹ Food borne illness associated with the intake of fruit juices are reported at many places in India that includes Amravati, Vidarbha, Bellary, Nagpur, Patiala, Pune and elsewhere that could turn out to be a public health threat.¹⁻⁶ Potential sources of entry of microorganisms are by environmental exposure via specific structures in the plants and through cracks in the tissues, inappropriate washing of fruits, unhygienic surroundings often with flies and dust, use of unhygienic water, use of unhygienic ice, sustained preservation without refrigeration and contamination by animal or human waste.³ Food borne diseases are spread through consumption of contaminated food products such as juices (For example: grapes, pineapple etc.) that have shown to be potential sources of bacterial pathogens like *E. coli*, *Vibrio cholerae*, *Vibrio parahaemolyticus* and *Staphylococcus aureus*, species of *Salmonella* and *Shigella*.⁷ The presence of coliforms on the surface of fruits and vegetables show the existence of fecal contamination and they harbor the intestinal tracts of man and animals and are excreted by excretion, in the form of faeces that can be pathogenic and can cause diseases like typhoid, dysentery, enteric fever etc.⁴⁻⁶ The present work was undertaken to assess the microbiological quality and safety of street vended sugarcane juice due to its high demand during the peak summer season from June 2013 to August 2013 in Noida city.

MATERIALS AND METHODS

Sample collection and pH determination

40 samples of freshly extracted sugarcane juice were collected randomly from the street vendors of Noida city from June 2013 to August 2013 in sterile containers and brought to the laboratory in an ice box and were analyzed within an hour of procurement. The juice sample was diluted by adding 10ml of sugarcane juice to 90ml distilled water in order to obtain isolated colonies of bacteria which can be pure cultured for further study. pH measurement was ascertained using pH meter.⁸⁻⁹

Determination of coliforms

The MPN (Most Probable Number) of total coliforms was determined following APHA (American Public Health Association) recommendations.¹⁰ The presumptive test was performed by inoculating 3 test tubes (with inverted Durham tube) each of 10ml of diluted sample to 10ml of double strength LTB (Lauryl Tryptose Broth, Himedia), 1ml diluted sample to 10ml single strength LTB (Lauryl Tryptose Broth, Himedia) and 0.1 ml diluted sample to 10ml single strength LTB (Lauryl Tryptose Broth, Himedia). The test tubes were

incubated at 37°C for 24-48 hrs. For confirmatory test, 0.1ml of sample from LTB tubes which showed positive results for gas and acid production were inoculated in 10ml BGGB (Brilliant Green Bile Broth, Himedia). The test tubes were incubated at 37°C for 24-48 hrs. The complete test was performed by streaking samples from tubes displaying positive results for gas and acid production on EMB (Eosin Methylene Blue agar, Himedia) and incubating the petriplates at 37°C for 24-48 hrs.¹¹⁻¹³ Indole test (biochemical test) was performed by adding 5 drops of Kovac's reagent to the LTB tubes.¹⁴ *Escherichia coli* gives a positive result that is indicated by the presence of red layer at the top of the tube.

Identification of microorganisms

Identification of species of *Staphylococcus* was done using Baird Parker agar, *Pseudomonas* using Cetrimide agar, *Salmonella* and *Shigella* using Bismuth Sulphide and CLED agars. The plates were incubated at 36±1°C for 24 hrs under aerobic conditions.

RESULTS AND DISCUSSION

In this study 40 freshly extracted sugarcane juice samples (without any other ingredients like lemon juice, ice etc.) were collected randomly from street vendors of Noida city from June 2013 to August 2013. The pH of the collected samples were in acidic range between 4-6 that contributes to the growth of certain microorganisms. The MPN of samples (total coliforms) range from 9.4 MPN per 100 ml to >2400 MPN per 100 ml. It is well observed that these juices are contaminated with coliforms such *Enterobacter aerogenes* and *Escherichia coli* that can cause diseases like urinary tract infections, chronic broncho-pulmonary diseases, pneumonia, septicemia, meningitis etc.¹⁵⁻¹⁶ Majority of the test tubes show positive indole test that indicates presence of *E. coli*. MPN analysis shows that 62.5% sample fall under the unacceptable category whereas 32.5% fall under the grossly polluted category. Only 5% sample fall under the acceptable category and none of the sample could qualify the excellent category as suggested by Cheesbrough *et al*.¹⁷ These results are provided in table 1. The presence of certain pathogenic microorganisms was observed on different selective medium. *Pseudomonas aeruginosa* (25%), *Salmonella spp* (57.5%), *Klebsiella spp* (90%), *S. aureus* (82.5%) and *Escherichia coli* (72.5%). The higher amount microorganisms have been found out in street vended juices in other parts of India as well¹⁸ (Figure 1) were that can cause diarrhea, urinary infection, pyogenic infections, septicemia etc. and are present mainly due to improper washing by workers, improper personal hygiene, unhygienic surroundings, vehicular transmission, sewage and the absence of good manufacturing practices.¹⁹⁻²⁰ These results show that majority of the street vended fresh juices showed contamination by harmful microorganisms and so regular monitoring should be done to improve quality of juices to avoid any future pathogenic onset.²¹

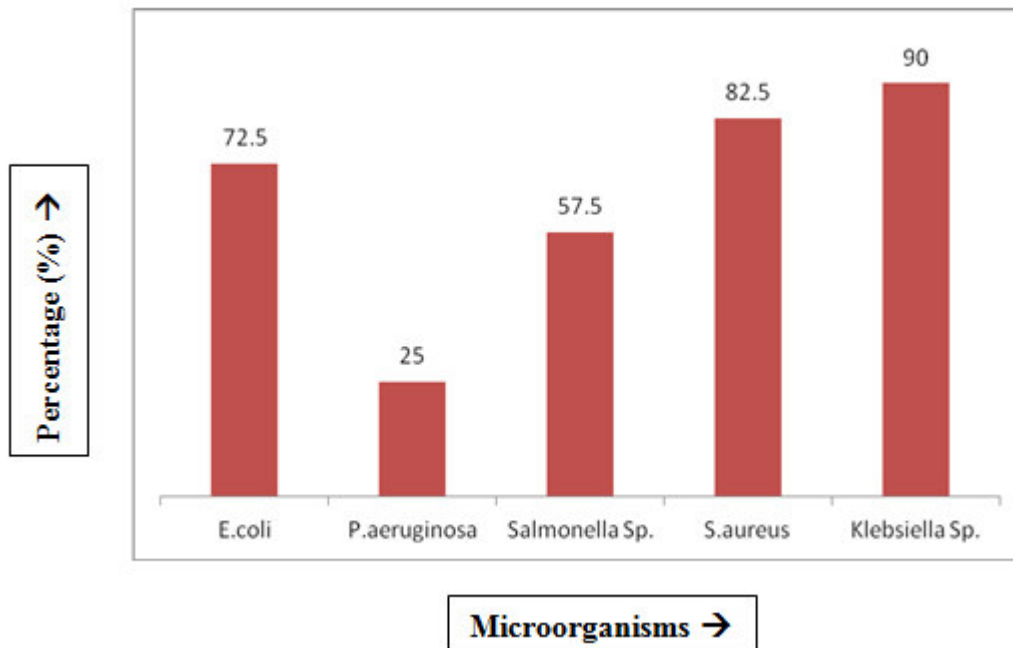


Figure 1
Percentage (%) of microorganisms identified from sugarcane juice sold in Noida city, India

Table 1
MPN analysis of sugarcane juice sold in Noida

Sample No.	MPN/100ml	Category
1, 2, 3, 14, 15, 17, 18, 28, 30, 33, 36	29	Unacceptable
4, 29, 35	460	Grossly polluted
5, 26, 31, 34	24	Unacceptable
6	290	Grossly polluted
7, 9, 10, 25, 37	53	Grossly polluted
8, 13	>2400	Grossly polluted
11	12	Unacceptable
12, 32	210	Grossly polluted
16, 19, 24, 27, 39	19	Unacceptable
20, 38	9.4	Acceptable
21, 23, 40	42	Unacceptable
22	44	Unacceptable

CONCLUSION

Fresh street vended sugarcane juice was found out to be contaminated with pathogenic microorganisms that cause a major public health concern. There is a need for regular monitoring of the street vendors to decrease the disease outbreak. The food safety agencies need to educate street vendors to maintain hygiene, use good quality water, use properly washed utensils, use good

quality ice, maintain personal and domestic hygiene, and a proper location of shops away from heavy vehicular traffic and waste disposal system. These measures might help to reduce disease risk.

CONFLICT OF INTEREST

Conflict of interest declared none.

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