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Assessment of Physico-Chemical and Microbial Quality of Sugarcane Juice Sold by Street Vendors in Three Regions of Bangladesh

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Abstract

Sugar cane juice is a popular refreshing drink in most part of Bangladesh. It has great taste and health benefits; also it is available most of the public places at reasonable prices which consumed by road side customers including general public, shopping personals, tourists, students. In our country, street vendors crushing sugarcane between roller crusher and sold without any heat treatment or preservative, also served with or without added ice and lemon juice. The study aimed to identify and compare the physico-chemical and microbial quality of sugarcane juice. The chemical qualities of juices including moisture, P^H, ash, total soluble solid, total sugar, reducing sugar and titrable acidity were found slightly different in Mymensingh, Gazipur and Narayangonj areas. The highest and lowest value of moisture, ash, P^H, total soluble solids, total sugar, reducing sugar and titrable acidity were found in 84.33% - 79.26% (Gazipur-Mymensingh), 0.57% - 0.04% (Mymensingh-Gazipur), 5.9 - 2.9 (Gazipur-Narayangonj), 17.48% - 4.98% (Mymensingh-Narayangonj), 21.9% - 6.56% (Mymensingh-Gazipur), 3.7 - 2.1 (Gazipur-Mymensingh) and 0.523% - 0.007% (Narayangonj-Gazipur) respectively. For microbiological analysis, the total viable count of sugar cane juice in Mymensingh, Gazipur and Narayangonj were ranged from 0.6×10^5 - 43.6×10^5 cfu/ml, 4.6×10^5 - 21.6×10^5 cfu/ml and 3.6×10^5 - 36.6×10^5 cfu/ml respectively, where the permitted value is 1.0×10^4 cfu/ml, whereas the total coliform count was ranged from 0.4×10^5 - 6.4×10^5 cfu/ml, 0.6×10^5 - 8.4×10^5 cfu/ml and 0.00 - 8.4×10^5 cfu/ml, where the permitted value is 100 cfu/ml and total fungal count was ranged from 5.5×10^5 - 56.5×10^5 cfu/ml, 21.5×10^5 - 54.5×10^5

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cfu/ml and 32.5×10^5 - 68.5×10^5 cfu/ml, where the permitted value is 1000 cfu/ml. According to the Gulf standard, the microbiological parameters of all the collected sugar cane juice were out of the permitted standards, so that a serious health outbreak can be caused anytime.

Keywords

Sugarcane, Street Vendors, Microbial Quality, Reducing Sugar

1. Introduction

In City, there is high demand for fresh juices especially in summer during the months of March through August [1]. Most of the sugarcane juices were sold in road side shops, recreational areas (parks) and busy market places by street vendors. Sugar cane juices are nutritious drinks with great taste and health benefits [2]. Sugarcane juice is a common man's refreshing beverage and it is sold at most of the public places at a reasonable prices. Drinking sugarcane juice instead of artificial and aerated drinks helps to improve the health of a person.

Unpasteurized juices are preferred by consumers because of the "fresh flavor" attributes and hence, in recent times, their demand has increased. It is nutritious and refreshing. It contains about 15% natural sugar and is rich in organic salts and vitamins. In most cases, sugarcane juice is not available in hygienic condition. At room temperature, sugarcane juice contains mainly mesophilic bacteria. At refrigerated condition, the growth is possible mainly due to psychrophilic bacteria [3]. Various pathogenic organisms like *Escherichia coli*, coliforms, enterococci, *Salmonella* spp., and *Vibrio cholerae* have been isolated from sugarcane juice by several workers [4] [5]. In our country, for fresh flavor, sugarcane juice was sold as unpasteurized condition. Especially unpasteurized juices have been shown to be a potential source of bacterial pathogens notably, *Salmonella, E. coli* O 157:H7 [6] [7] [8].

Use of unhygienic water for dilution, prolonged preservation without refrigeration, unhygienic surroundings often have been shown to harbor bacterial pathogens notably *Escherichia coli*, *Salmonella* spp., *Shigella* spp., and *Staphylococcus aureus* of sugarcane juice [9] [10]. Changes in pH may also promote the growth of pathogens [11]. There is health risks associated with initial contamination of foods by pathogenic bacteria as well as subsequent contamination by vendors during preparation, handling and cross contamination [12].

The major ingredients of the juice such as water, sugar, natural fruit pulp etc. may also carry some microbial contaminants. During the preparation, bare hands were used for handing the ice and sieving of juice. The utensils and glasses were washed just by dipping in the same water. Water used for juice preparation can be a major source of microbial contamination. Other factors can act as source of contamination such as use of improper handling, unhygienic water for dilution.

Considering the above requirements, this study was designed with the objec-

tives of determining the microbial colony numbers and chemical parameters of sugarcane juices in Mymensing, Gazipur, Narayangonj and comparing the parameters among the juices of these 3 districts samples which influence the consumer to make decision whether the juice they drinking are safe or not and help them to make correct decision.

2. Materials and Methods

2.1. Study Design

An analytical study based on chemical and microbiological quality assessment with comparison between sugarcane juices of three areas. Sugarcane juices were collected from Gazipur, Mymensingh and Narayangonj areas. Samples were collected from 10 important places of Gazipur, Mymensingh and Narayangonj for each during October 2022 to September 2023. The samples analyses were conducted in the laboratory of Food Technology and Nutritional Science Department, Mawlana Bhashani Science and Technology University, Sanntosh, Tangail, Bangladesh (**Table 1**).

2.2. Physico-Chemical Analysis of Sugarcane Juice

2.2.1. Determination of Moisture Content

Moisture percentages of sugarcane juice were determined by oven drying method [13]. A crucible first washed and dried up. The weight of the crucible was taken. Then 9 ml of sample was taken in the crucible and weighted. Crucible plus sample is then placed in an oven heated at 105˚C for 4 hours. The sample plus crucible was placed in desiccators and weighted. Repeated this process until final weight reached to constant weight.

$$\text{Percentage of moisture} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Sample weight}} \times 100$$

2.2.2. Determination of Ash Content

Ash percentages of sugarcane juice were determined by incineration of samples in a muffle furnace [14]. Nine ml of sample was taken in a crucible. The sample was heated at 105˚C for 3 to 4 hours. Sample was then heated in a muffle furnace at 600˚C for 3 to 4 hours. Sample was then cooled and ash content of the supplied sample was measured.

$$\text{Percentage of Ash} = \frac{\text{Weight of ash}}{\text{Weight of sample}} \times 100$$

2.2.3. Determination of Total Soluble Solid (TSS)

Total solid contents of sugarcane juices were determined by oven drying method [13]. A previously weighed empty, dry and clean flat bottom aluminum cup was taken. Nine ml of sample was weighed out into the cup. The cup was then placed on a hot place at 180˚C, until the residue begins to turned light brown. For drying the cup was then placed into an oven operated at 100˚C for 10 - 15 minutes. After drying, sample was taken out from the oven and cooled in desiccators, for

Table 1. Sample collection areas.

Collection area	Location	Sample No.
Mymensingh	Shambugonj	MS1
	Fulbariya Bus Stand	MS2
	Muktagacha	MS3
	Bridge Mor	MS4
	Chorpara	MS5
	Sardha Gosh Road	MS6
	Aawkuah	MS7
	Ganghinapar	MS8
	BAU Jobbar Mor	MS9
	Dapunia Bazar	MS10
	Zero Point	MS11
Gazipur	Pubail	GS1
	Kamar Para	GS2
	Abdullah Pur	GS3
	Tongi Bazar	GS4
	College Gate	GS5
	Station Road	GS6
	Shimultoli	GS7
	Sign Board	GS8
	Board Bazar	GS9
	Baro Bari	GS10
	Bibi Bazar	GS11
Narayangonj	Jela Nirbachan office	NS1
	Shibu market	NS2
	Chashara mor	NS3
	2 no. gate	NS4
	Ukil para	NS5
	B. B. market	NS6
	Balur madth	NS7
	Nur musjid	NS8

5 minutes. Then the cup with the dried sample was weighed out carefully.

$$\text{Percent of total solids} = \frac{\text{Weight of sample after drying}}{\text{Weight of sample before drying}} \times 100$$

2.2.4. Determination of Total Sugar by Titration with Fehling's Reagent

Total sugar estimation is the analyses of total sugar present in food item. 10 - 15

gm sample was taken in a volumetric flask then add 45% ethanol and boiled for 1 hour. Then cooled and make the volume 250 ml with 50% ethanol. Then evaporate the ethanol and transferred into a volumetric flash and then 5 ml clarifying solution 1 and 2 was added and filtered solution was used for free sugar analysis. 5 ml of 6.35N HCL was added in the 20 ml supernatant solution and hydrolyzed on a boiling water bath for 30 minutes. Cooled and added few drops of phenolphthalein and then neutralized with 40% and 0.1N NaOH. Filtered and make the volume 100 ml with distilled water and the solution was taken into a burette. Then titrate with 5 + 5 ml Fehling's solution A and B with methyl blue indicator in a boiling temperature [15].

$$\text{Total Sugar} = \frac{0.063\times 100(\text{vol.after hydrolysis})}{\text{titration reading}}$$

$$= \frac{X\times 100(\text{vol.after clarification})}{\text{vol.of sample taken for hydrolysis}}$$

$$= \frac{Y\times 250(\text{initial vol.})}{\text{total vol.}}$$

$$= \frac{Z\times 100(\text{percent})}{\text{wt.of sample}}$$

Here X = result of first step, Y = result of second step and Z = result of third step.

2.2.5. Determination of Reducing Sugar by Titration with Fehling's Reagent

Determination of reducing sugar is the analyses of free reducing sugar present in food item. 10 - 15 gm sample was taken in a volumetric flask then add 45% ethanol and boiled for 1 hour. Then cooled and make the volume 250 ml with 50% ethanol. Then evaporated the ethanol and transferred into a volumetric flash and finally add 5 ml clarifying solution 1 and 2 and filtered solution was used for free sugar analysis. 5 ml of Fehling's solution 2 was taken in a conical flask and added same volume of Fehling's solution 1. Just before use 50 ml of distilled water was added and heat on a hot plate. At the start of boiling point 2 - 3 drops of methyl blue was added and titrated with stock sugar solution [15].

$$\text{Reducing Sugar} = \frac{0.063\times 100(\text{final vol.})}{\text{titration reading}}$$

$$= \frac{X\times 100(\text{vol.after clarification})}{\text{vol.of sample taken for hydrolysis}}$$

$$= \frac{Y\times 250(\text{initial vol.})}{\text{total vol.}}$$

2.2.6. Estimation of Titrable Acidity

At first 10 ml sugarcane juice was taken in conical flask. If juice dark adds some distilled water but not more than 5 times. Then 3 - 5 drops phenolphthalein is added in the juice. Ensure the tap on the burette is shut and using a funnel pour the 0.1 M solution of NaOH into the burette until it reaches the zero mark.

Slowly titrate the NaOH into the juice/water solution (with a 25 ml burette or an automatic burette). Using phenolphthalein as an indicator, the point of neutrality is reached when the indicator changes from colorless to pink. The indicator color must remain stable (persisting for 30 seconds) and be light pink when viewed over a white background [16].

$$\%\ \text{acid} = \frac{[\text{mls NaOH used}]\times[0.1\text{N NaOH}]\times[\text{milliequvalent factor}]\times 100}{\text{grams of sample}}$$

2.2.7. Determination of P^H

Sension TM+ P^H 31, P^H meter were used for determination of P^H. Checking the P^H meter and make sure the P^H meter has worked well. P^H meter set in a dry place. Calibrate the meter containing a buffer solution of P^H 4, P^H 7 and P^H 10. Whenever readings are taken correctly, ensure that the meter is worked correctly. After rinsing in distilled water, place the sample solution to be tested, then take the reading correctly [17].

2.2.8. Microbial Analysis

Total Viable Count (TVC), Total Coliform Count (TCC) and Total Fungal Count (TFC) were for fruit juice, sherbet, ingredient water and waste water samples were done according to the method of The International Commission on Microbiological Specifications for Foods [18]. In this study, Nutrient Agar from OXOID Ltd., Basingstoke, Hampshire, England was employed. Ingredients of recommended quantities were weighted by electric balance and were dissolved in prescribed amount of distilled water. Prepare 300 ml nutrient agar media in a conical flask then the mixture was boiled to mixture the ingredients thoroughly. Clean and fresh glass ware used in the experiment. All glass wares like plate, pipette were sterilized in a hot oven (Model No.980435, made in Germany) at 180˚C for 2 hours. All kinds of media, solutions and glass bottles were sterilized at 15 P.S.I (Pounds per square inch) for 20 minutes at 121˚C in an autoclave (Model No. JSAC-50). 1 ml of the sugarcane juice was diluted with 9 ml of sterile buffered peptone water and mixed well (10^{-1} dilution). Serial dilutions were prepared and spread plate technique was used on solid media. Serial dilutions of samples were made up to 10^5 with sterile buffered peptone water. 0.1 ml of each dilution was evenly spread on the nutrient agar medium and incubated. Plates were screened for the presence of discrete colonies after incubation period and the actual numbers of bacteria were estimated as colony forming unit per ml (cfu/ml).

2.3. Statistical Analysis

All the experiments were done with replication and analyzed with mean through Microsoft Excel 2007.

3. Results

The study was conducted to compare the physicochemical and microbiological quality of sugarcane juice, 30 samples were collected from different areas of

Mymensingh, Gazipur and Narayangonj. The objective of the study was to determine the chemical and microbiological quality of sugarcane juice which influence the consumer to make decision rather the juice they drinking are safe or not and help them to make correct decision.

3.1. The Physico-Chemical Analysis of Sugarcane Juice Collected from Different Areas of Mymensingh

Sugarcane juices collected from different vendors of Mymensingh areas and estimated the chemical parameters in the laboratory and plotted in the following Table 2 indicate that the highest value of moisture, P^H, ash, total soluble solid and titrable acidity were found about 82.88%, 5.35, 0.57%, 17.48% and 0.465% respectively, where the lowest value were about 79.26%, 5.0, 0.16%, 9.48% and 0.205% respectively in Mymensing areas.

3.2. Physico-Chemical Analysis of Sugarcane Juice Collected from Different Areas of Gazipur

Following table represents the chemical analysis of sugarcane juice where, moisture content, P^H measurement, ash content, total soluble solid, and acidity of Gazipur samples were determined.

Table 3 shows that the highest value of moisture, P^H, ash, total soluble solid and titrable acidity were found about 84.33%, 5.90, 0.27%, 11.98% and 0.396% respectively, where the lowest value were about 81.22%, 4.92, 0.04%, 5.98% and 0.077% respectively in Gazipur areas.

3.3. Physico-Chemical Analysis of Sugarcane Juice Collected from Different Areas of Narayangonj

Following table represents the chemical analysis of sugarcane juice where, moisture

Table 2. Physico-chemical parameters of samples collected from Mymensingh.

Samples No.	Moisture %	P^H	Ash %	Total soluble solid %	Titrable Acidity %
MS_1	79.26	5.11	0.46	17.48	0.278
MS_2	80.10	5.0	0.37	13.98	0.266
MS_3	78.60	5.05	0.57	16.01	0.288
MS_4	81.44	5.35	0.42	9.48	0.285
MS_5	82.37	5.26	0.27	9.98	0.263
MS_6	82.88	5.03	0.17	17.48	0.204
MS_7	81.21	5.12	0.23	10.01	0.302
MS_8	82.76	5.33	0.16	11.48	0.299
MS_9	81.87	5.32	0.29	10.98	0.215
MS_{10}	82.11	5.31	0.19	10.48	0.315

content, P^H measurement, ash content, total soluble solid, and acidity of Narayangonj samples were determined.

Table 4 indicate that the highest value of moisture, P^H, ash, total soluble solid and titrable acidity were found about 83.45%, 5.9, 0.23%, 10.48% and 0.523% respectively, where the lowest value were about 80.48%, 4.29, 0.08%, 4.98% and 0.220% respectively in Narayangonj areas.

From Table 5 highest average value of ash and TSS found in Mymensingh region but it was lowest in moisture content with 81.17%. Highest moisture (82.69%) and p^H (5.35) found in Gazipur region with a lowest average value of ash (0.15%) and tritable acidity (0.220%). The samples of Narayanganj contained highest acid value (0.371%) with lowest p^H (4.97%) value. The reasons might be

Table 3. Physico-chemical parameters of samples collected from Gazipur.

Samples No.	Moisture %	P^H	Ash %	Total soluble solid %	Titrable Acidity %
GS_1	81.50	5.45	0.27	6.98	0.235
GS_2	81.22	4.92	0.21	11.98	0.077
GS_3	81.88	5.41	0.20	6.98	0.324
GS_4	82.45	5.26	0.18	7.01	0.201
GS_5	82.67	5.17	0.19	7.98	0.097
GS_6	84.52	5.27	0.07	6.98	0.178
GS_7	83.22	5.51	0.10	5.98	0.396
GS_8	84.33	5.70	0.04	5.98	0.387
GS_9	82.87	5.08	0.12	8.98	0.121
GS_{10}	82.28	5.72	0.15	6.98	0.186

Table 4. Physico-chemical parameters of samples collected from Narayangonj.

Samples No.	Moisture %	P^H	Ash %	Total soluble solid %	Titrable Acidity %
NS_1	83.45	4.29	0.08	4.98	0.412
NS_2	81.15	4.99	0.19	6.98	0.231
NS_3	81.78	5.15	0.14	7.98	0.405
NS_4	81.92	4.75	0.19	6.98	0.370
NS_5	80.71	4.76	0.13	8.98	0.298
NS_6	80.48	4.32	0.21	6.98	0.523
NS_7	82.43	5.23	0.09	8.48	0.482
NS_8	81.42	5.13	0.22	8.48	0.299
NS_9	81.84	5.90	0.23	5.98	0.220
NS_{10}	80.66	5.20	0.31	10.48	0.465

the: Sugarcane production system, land preparation, planting seasons, planting methods, types of soil and its composition, farming and manure system, irrigation and harvesting system. The delay in extraction of harvested sugarcanes is reported to cause some changes in the juice quality.

3.4. Microbial Analysis of Selected Sugarcane Juice at Different Areas

30 samples were collected from different areas of Mymensingh, Gazipur and Narayangonj and were examined for the microbial analysis.

Highest TFC (57.1×10^5 cfu/ml) and TCC (5.06×10^5 cfu/ml) value were found in Narayanganj samples and highest TVC (14.9×10^5 cfu/ml) found in Mymensingh region. All the values indicate that they all highly exceeded the maximum permitted value according to Gulf standard (2000). The reasons behind this huge amount of contamination were unhygienic water for dilution, high temperature, unhygienic surroundings, use of unhygienic utensils etc. In most cases, running water is not available at vending sites; hands and utensils washing are usually done in one or more buckets, and sometimes without soap (Table 6).

4. Discussions

In the 20th century, sugarcane has been successfully established as an important agriculture crop in Bangladesh. Fresh sugarcane juice is very popular as refreshing delicious drink all parts of our country and it is rarely available commercially in packaged form. Processing and marketing of sugarcane juice is limited by its

Table 5. Average comparison of physico-chemical properties among Mymensingh, Gazipur and Narayanganj samples.

Region	Moisture (%)	P^H	Ash (%)	Total Soluble Solid (TSS) (%)	Tritable acidity (%)
Mymensingh	81.17	5.17	0.33	12.99	0.267
Gazipur	82.69	5.35	0.15	7.58	0.220
Narayanganj	81.58	4.97	0.179	7.63	0.371

Table 6. Average comparison of microbial analysis of selected sample for all areas.

Samples	Total viable Count (TVC) $\times 10^5$ cfu/ml	Total Fungal Count (TFC) $\times 10^5$ cfu/ml	Total Coliform Count (TCC) $\times 10^5$ cfu/ml
Mymensing	14.9	42.9	4.1
Gazipur	12.9	40.3	3.64
Narayangonj	13.2	57.1	5.06
Gulf Standards (max. permitted) cfu/ml)	100	1000	100

rapid deterioration [19].

Bacterial contamination of sugarcane juice may occur at different stages such as by roller drum crushers, collecting vessels, ice added to the juice, hands of the personnel and the filter. The delay in extraction of harvested sugarcanes is reported to cause some changes in the juice quality [20]. Use of unhygienic water for dilution, without cooling, unhygienic surroundings often have been shown to harbor bacterial pathogens notably *Escherichia coli*, *Salmonella* spp., *Shigella* spp., and *Staphylococcus aureus* of sugarcane juice [21]. Serious health hazards due to the presence of pathogenic microbes in food can lead to food poisoning outbreaks. Many outbreaks of food borne diseases have been reported due to consumption of unpasteurized and contaminated juices [22]. Urging from this point present study carried out to determine the microbial load of sugarcane juice used by street vendors in Mymensingh, Gazipur and Narayangonj city and results were discussed below. From **Table 2**, we can see that the highest and lowest values of moisture, pH, ash, total soluble solid, reducing sugar, total sugar, titratable acidity for Mymensingh samples were 82.88% - 79.26%, 5.35% - 5.0%, 0.57% - 0.16%, 17.48% - 9.48%, 3.7% - 2.56%, 21.9% - 7.9% and 0.465% - 0.205% respectively. From **Table 3** for the chemical properties of Gazipur, the highest and lowest value of moisture, ph, ash, total soluble solid, reducing sugar, total sugar, titratable acidity for Gazipur samples were 84.33% - 81.22%, 5.9% - 4.92%, 0.270.04%, 11.98% - 5.98%, 3.06% - 2.1%, 12.2% - 6.56% and 0.396% - 0.077% respectively. From **Table 4** for the chemical properties of Narayangonj, the highest and lowest value of moisture, pH, ash, total soluble solid, reducing sugar, total sugar, titratable acidity for Narayangonj samples were 83.45% - 80.48%, 5.23% - 4.29%, 0.22% - 0.08%, 8.98% - 4.98%, 3.10% - 2.4%, 13.12% - 7.06% and 0.523% - 0.231% respectively. Krishnakumar & Devadas (2013) found total soluble solid, total sugar, p^H, titrable acidity ranged from 15% - 22%, 10% - 18%, 5.00% - 5.50% and 0.178% - 0.29% respectively which slightly mach with our present study [23]. According to Swaminathan (2001), moisture and reducing sugar ranged from 75% - 85% and 0.3% - 3.0% respectively that also has similarity with our present study [24]. In the present study, values found from Mymensing, Gazipur, and Narayangonj samples were different from each other. The reasons might be the: Sugarcane production system, land preparation, planting seasons, planting methods, types of soil and its composition, farming and manure system, irrigation and harvesting system & etc. It has been argued that there are various problems in estimating input output relationship using survey data, because of the variables are not controlled as they are in an experiment [25]. The recommended microbiological standards for any fruit juice; all numbers are as per ml of juice consumed [26].

From the present study we found that the minimum and maximum range of Total viable count, total coli form count and total fungal count of sugarcane juice for Mymensing areas was ranged from 0.6×10^5 - 43.6×10^5 cfu/ml, 0.4×10^5 - 6.4×10^5 cfu/ml and 5.5×10^5 - 56.5×10^5 cfu/ml. For the Gazipur samples minimum and maximum range of Total viable count, total coli form count and

total fungal count were 4.6×10^5 - 21.6×10^5 cfu/ml, 0.6×10^5 - 8.4×10^5 cfu/ml and 21.5×10^5 - 54.5×10^5 cfu/ml. For the Narayangonj samples minimum and maximum range of Total viable count, total coli form count and total fungal count were 3.6×10^5 - 36.6×10^5 cfu/ml, 0.00×10^5 - 8.4×10^5 cfu/ml and 32.5×10^5 - 68.5×10^5 cfu/ml. Table 7 indicates that, the highest and lowest average value of TVC, TFC and TCC was found 14.83×10^5 - 13.51×10^5 cfu/ml (Mymensingh-Gazipur), 57.00×10^5 - 41.95×10^5 cfu/ml (Narayangonj-Gazipur) and 4.98×10^5 - 3.8×10^5 cfu/ml (Narayangonj-Gazipur) respectively. According to Javed ali, Mohammad Siddique (2015), minimum and maximum range of Total viable count, total coliform and total fungal count were 2×10^2 - 2×10^4 cfu/ml, 2.3 - 1100 cfu/ml and 4×10^2 - 3×10^7 cfu/ml respectively, which is slightly similar with our present study. It is fact that all the samples analyzed were found to be contaminated with different bacteria is matter of concern. These juices are contaminated by various processes. Water used for juice preparation can be a major source of microbial contaminants [27]. If ice and source water used is of poor quality, harmful microorganisms may persist in cane juice. In most cases, running water is not available at vending sites; hands and utensils washing are usually done in one or more buckets, and sometimes without soap. Some of the juices are not efficiently protected against flies, which may carry food borne pathogens. There is health risks associated with initial contamination of foods by pathogenic bacteria as well as subsequent contamination by vendors during preparation, handling and cross contamination. Street vendors are mostly ignorant of good hygienic practices (GHP) and cause diarrheal diseases, which can increase the risk of street food contamination. Serious health hazards due to the presence of pathogenic microbes in food can lead to food poisoning outbreaks [28]. All of sugarcane juices in our present study were found to be unfavorable for consumption because about all of them showed exceeded acceptable range of microbial load. Negligence in city areas may result in serious contamination that ultimately represents a low quality product sold by vendors to the consumers. This not only suggests that these juices are not very hygienic, but it also puts customers at risk of food-borne illnesses. Thus, it can be shown that every sugarcane juice sample from vendors in Mymensingh, Gazipur, and Narayangonj that was analyzed included more bacteria than was considered safe for human consumption.

5. Conclusion

The present study was undertaken to evaluate the safety parameters of street

Table 7. Gulf Standard for Microbial Count.

Parameter	Total viable count	Total Coli form count	Total fungal count
Maximum count anticipated	5.0×10^3	10	100
Maximum count permitted	1.0×10^4	100	1.0×10^3

vended sugarcane juices sold in different location of Mymensingh, Gazipur and Narayangonj city. In the study, 30 samples from these 3 areas were collected to estimate the physoco-chemical property and microbial analysis. Physico-chemical values found from Mymensing, Gazipur, and Narayangonj samples were different from each other. The reasons might be the: Sugarcane production system, land preparation, planting seasons, planting methods, types of soil and its composition, farming and manure system, irrigation and harvesting system & etc. All sugar cane juices collected from the areas of Mymensingh, Gazipur and Narayangonj were highly contaminated with harmful microbes. Total bacterial count in the most of the juice sample was higher than the standard permitted value. Highest viable count was found in Gazipur. Lowest viable count was found in Narayangonj. Most of the samples showed equal or higher count than the permitted value. Water used for juice preparation can be a major source of microbial contaminants. If ice and source water used is of poor quality, harmful microorganisms may persist in cane juice. In most cases, running water is not available at vending sites; hands and utensils washing are usually done in one or more buckets, and sometimes without soap.

6. Limitations of the Study

At the time of conducting the study, several minor problems were experienced. The limitations of the study are given below:

- The effective time allowed to complete this study was not enough due to some uncontrollable variables which have squeezed our total effective time period.
- Sophisticated laboratory equipment and proper packaging materials is mandatory for any secure output of study.
- There were lacking in the laboratory supports and it was one of the limitations that handicappsd us to carry out extensive experiments.
- Costs with this type of work are significant. So without any financial assistance, it would be very difficult to carry forward these types of empirical project in practice.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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