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SUGARCANE JUICE AS POTENTIAL SOURCE OF ANTIBIOTIC RESISTANT *SALMONELL S* SUGARCANE JUICE AS A POTENTIAL SOURCE OF ANTIBIOTIC RESISTANT *SALMONELLA* SPP. SUGARCANE JUICE AS A POTENTIAL SOURCE OF ANTIBIOTIC RESISTANT *SALMONELLA* SPP.

Sehrish Amjad[1], Samreen Riaz[2], Faiza Saleeem[3]

Department of Biotechnology, Lahore College for Women University, Lahore, Punjab, Pakistan[1]
Institute of Microbiology and Molecular Genetics, University of Punjab, Lahore, Punjab, Pakistan[2*], 03004351979, Email: samreen.mmg@pu.edu.pk

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ABSTRACT

Many segments of the population now get affordable foods because of growing trend of street vending in developing nations. There have been reports from all over the world that fruit juices sold on streets are tainted with numerous bacteria causing a number of human illnesses. Major outbreaks brought on by microbial pathogens of fruit juices have resulted in severe illness and mortality in underdeveloped nations. This study determine the prevalence of antibiotic resistant *Salmonella* spp. in sugarcane juice samples available from street vendors in Shahadara Lahore. Ten sugarcane juice samples were bought from different street vendors. Microbiological assessment tests were performed on each sample. Salmonella Shigella (SS) and MacConkey agar ere used as the media from the growth of bacteria. To check the resistance of Salmonella of four antibiotics were used. When compared to the advised standard safety practices, the findings showed that the majority of the suppliers did not adhere to cleanliness and safety practices. On SS and MacConkey agar highest contamination was found to be 2.45×10^5 and 7.8×10^5 *Salmonella* cfu per serving of sample, respectively. Highest antibiotic resistance was found against cefotaxime as 7.5×10^4 cfu per serving of sample in SJS10. Microbiological quality of sugarcane juices fell beyond permissible ranges, possibly as a result of the poor water quality used to make the juices as well as the sellers' poor hygiene and safety procedures. The isolated microorganisms were ciprofloxacin and cefotaxime resistant, which could have serious effects on public health. The research on antibiotic resistant bacteria in sugarcane juices had not been done before from this region has added fresh knowledge to the field's domain of research.

Keywords: *Salmonella*, Sugarcane juice, Antibiotic resistance, Prevalence, Ciprofloxacin, Gentamicin, Azithromycin, Cefotaxime

INTRODUCTION

Fruits are a crucial part of a balanced diet. Numerous phytonutrients found in them have been linked to a number of health advantages, including boosting the immune system. Consumption options include eating them raw or turning them into juice. To increase the shelf life of the juice, it can either be drunk right away or put through additional local or commercial processing and packaging (Jimma *et al*., 2022). Juices and other liquid refreshments are considered as nutritional, natural, recreational, energizing, therapeutic and traditional drinks against various health problems. They are beneficial in preventing tooth decay, combating cancer, balancing blood sugar levels, assisting in weight loss, decreasing fevers, cleaning the kidneys, and a variety of other health advantages. Freshly prepared juices are also called as rapid energy boosters because they include active nutrient and enzymes that are quickly absorbed into the bloodstream and provide immediate nourishment (Alim *et al*., 2022).

Fruit juices and drinks must be free of organisms, such as bacteria, and fungus as well as viruses have been identified as potential disease causing microorganisms that can be the source of foodborne illnesses due to the availability of supply of nutrients, moisture content, and pH in fruit juices, all of which promote microbial growth (**Afreen *et al*., 2019**). Consuming of street vended beverages, food and drinks, on the other hand, raises the risk of food contamination. Food and beverages sold on the street, in particular, are frequently associated with inadequate facilities. Furthermore, hawkers lack environmental controls also including temperature and moisture management, which are

necessary to ensure the safe and secure environment of their food goods. Food handlers are the most common source of foodborne illness contamination because they can easily introduce bacteria to food, particularly through the fecal oral route, skin wounds, and unclean food preparation areas.

In Malaysia, around 60.28 instances of food and waterborne infections have been diagnosed per 100,000 people, twowith typhoid fever disease being the most common. *Salmonella* spp. is a pathogenic microorganism that has been detected in drinkable natural resources such as water and fresh waterbodies. *Citrobacter* spp., on the other hand, is a nosocomial disease causing bacteria that can be found in the digestive, bronchial, and urinary tracts of both animals and humans, as well as in water and soil habitats and food stuffs. *Citrobacter*spp. may not be frequently checked in food products due to its low occurrence in Malaysia, yet this bacteria has been linked to foodborne outbreaks in other countries (**Zulfakar *et al.*, 2021).**

In Mexico and the United States, *Salmonella typhi*has been found in samples of orange juice, and *Escherichia coli* and *Vibrio cholera* have been detected often in Bangladesh and Japan. In metropolitan India, such as Haryana, Hyderabad, Kerala, Punjab, Delhi and Kolkata, microbiological infiltration of fruit drinks sold by street sellers has been documented. The amount of pathogens in fruit drinks is frequently found to be higher than the allowed limits. More crucially, due to the advent of antibiotic resistance, the public health threat posed by contaminated juices has worsened in recent decades (**Sharma *et al*., 2020**).

The microbial contamination of different organic fruit juices with *Salmonella* spp. *Escherichia coli*, and *Staphylococcus aureus* of prime worry since these pathogenic microorganisms have been perceived to cause various fruit juice related outbreaks **Tambekar *et a*., (2009)** isolated a number of expected bacterial microorganisms: *Salmonella* spp., *E. coli*, *Pseudomonas aeruginosa*, *Enterobacter* spp., *Klebsiella*spp. and *Staph. aureus* from various kinds of street vended organic fruit juices. Potential pathogenic microbes, like *E. coli*, *Salmonella* spp., *Shigella*spp. and *Staph. aureus* have been isolated from sugarcane juice, grape, sweet lime, sapota juices and pineapple. Various anti-microbial resistance among the food-borne microorganisms strongly worsen the situation causing fruit juice related outbreaks. In our part of the globe fruit juices sold on the streets are popular among local consumers, not only for their health benefits, but also for their taste, affordability, their ease of use and availability, despite concerns about the safety and microbiological quality of ready-to-drink freshly prepared fruit juices, due to a lack of scientific data on safety issues. Therefore, the study of **Mandal and Mandal (2018)** was undertaken for bacteriological profiles of locally available fruit and sugarcane juices from street vendors and antibiotic susceptibility testing for the isolated microorganisms.

Saccharum of ficinarum commonly known as sugarcane is a perennial grassland plant in the Poaceae family that is grown for its sucrose-producing stem**.** Sugarcane juice is a nutritious scrumptious beverage extracted from crushed sugarcane and served chilled. It is additionally plentiful in nutrients, mineral salts, basic sugars and natural acids that are acclimatized by individuals. Nowadays sugarcane juice has become piece of the everyday diet in many net-works somewhat because of its refreshing capacity in tropical warm climates. Nonetheless, due to ideal pH, high water and sugar substance just as appropriate temperature; sugarcane juice will in general decay quickly even under refrigeration (**Mwambete and Mpenda, 2019**). The phenolic compounds in sugarcane (*Saccharum officinalrum*) are abundant. Sugarcane has previously been studied for its antioxidant DNA damage protecting, anti-proliferative and anti-mutation, with promising results. Recently, there has been a surge in interest in extracting bioactive compounds from residual natural sources. Sugarcane bagasse is among the most common agricultural by-products, with an average output of more than 543 million tons. However, there are few studies that have been published on the antibacterial effects of extract of bagasse of sugarcane against pathogenic intestinal microorganisms (**Zhao *et al*., 2015**). At present, there is an increment of sugarcane juices vendors. Usually, during the production process of sugarcane juice, hygienic conditions are not very much noticed. Such poor clean circumstances during handling may likewise speed up the physicochemical changes influencing its pH and composition prompting microbial proliferation. An increased number of microorganisms in juices can prompt to foodborne diseases or infections. Such infections may not just obstruct the diagnosis of other infectious microbial illnesses but also add to high mortality and morbidity in vulnerable people to food-related infections (**Mwambete and Mpenda, 2019**).

Salmonella spp. are Gram-negative bacteria. They are facultative anaerobes and are flagellated with three main antigens: H (flagellar antigen), O (soma antigen), and antigen Vi that is only cont-

ained by few serovars**.** Phase 1 and phase 2 antigens are two types of H antigen that can app-ear in one or both of their forms. The microorganisms have a tendency to transition from one stage to the next. O antigens are found on the outer membrane's surface and are defined by sugar sequencing on the surface of the cell. The Vi antigen is a surface antigen that lies on top of the O antigen and is found in only a few serotypes, the most significant of which is ***Salmonella typhi*** *Salmonellae* spp. cell membrane, like that of other Gram-negative bacteria, comprises a complex polysaccharide construct that is released during cell disintegration and, to some extent, during culture. The lipopolysaccharide moiety could act as an endotoxin and play a role in determining the pathogenicity of organisms. *Salmonellae* are prevalent animal and human disease causing organisms, and salmonellosis, which effects about1.5 million Americans each year, is a world-wide problem. In humans, salmonellosis normally manifests as a selflimiting foodborne illness (gastroenteritis), but it can also manifest as a severe systemic illness (enteric fever) that requires antibiotic treatment right away. The seriousness of the infection, as well as whether it stays in the intestine or spreads to the bloodstream, may be determined by the patient's resistance and the pathogenicity of the *Salmonella* strain. *Salmonella* gastrointestinal poisoning of food has a different incubation period depending on the bacteria dosage. Nausea, vomit, diarrhea, and abdominal discomfort are common symptoms that appear 6 to 48 hours after consuming infected water or food (**Bakhshandeh *et al*., 2022**).

Antibiotic resistance is a global phenomenon bringing about the appearance of pathogens that are resistant to clinically significant antibiotics, requiring new treatment techniques. Foodborne related antibiotic resistant pathogens for example, *Salmonella* spp. is a central issue for general health care. More concern is expected to object them in the supply of animal food. It is difficult to exclude *Salmonella* from its residing host and food related animals mostly acts as the inhabitants of the pathogens. Non typhoidal type of *Salmonella* is base of the biggest quantity of diseases, deaths and hospitalizations related with foodborne ailment. It is related with in excess of 1,200,000 sicknesses every year, and among these something like 100,000 diseases are because of antibiotic resistant *Salmonella*, in which clinically significant drugs such as ciprofloxacin (Thirty three thousand illnesses per year) and ceftriaxone (Thirty six thousand illnesses per year) are included. As a matter of fact isolates of *salmonella* offers resistance to greater than or equal to 5 antibiotics for more than 66000 ailments from 2009 to 2011 in the United States (***Sharma et al.,* 2020**).

Antibiotic resistance acquisition and transmission are complex processes involve multiple parts of human system of food chain, and might be a result of increased antibiotic usage in food animal husbandry, among other factors. With such serious issues about the development of antibiotic resistance in pathogenic organisms, including evolving multi drug resistance strains, the Food & Drug Administration (FDA) recently announced the 12 Veterinary Feed Directive (VFD), which requires veteranarian supervision prior to using important clinical antimicrobial drugs in trying to treat production animals. The Veterinary Feed Directive emphasizes the necessity of using antibiotics sparingly in animal husbandry and calls for the discovery of natural, secure, and ecologically friendly treatment techniques against dangerous food - borne illnesses such as *Salmonella* (**Nair *et al*., 2018**).

MATERIALS AND METHODS

2.1. Place of work: All research work was conducted in BS laboratory of Lahore College for Women University.

2.2. Study area: Sugarcane juice samples were collected from Shahdara a city in Punjab Pakistan.

2.3. Sample collection: Samples of freshly prepared sugarcane juice SJS1, SJS2, SJS3, SJS4, SJS5, SJS6, SJS7, SJS8, SJS9 and SJS10 were bought from 10 different vendors of Shahdara Lahore. Sugarcane juice was collected in sterilized capped jars and immediately kept at 4°C using an ice box. During the collection of samples all the hygienic and aseptic conditions were maintained. All the samples were brought to BS laboratory of Lahore College for Women University in sterilized capped containers and were processed in 24 hours after collection**.**

2.4. Media preparation: For the identification of *Salmonella* spp. *Salmonella Shigella* (SS) and MacConkey were used. For the preparation of SS 5.2 grams of SS as weighed and dissolved in 100 mL of distilled and autoclaved water in a sterilized conical flask. Then took the solution to boil on a hot plate. After mixing well the solution was poured in sterilized glass plates in Laminar flow cabinet. For the preparation of MacConkey five grams of weighed media was dissolved in 100 ml of distilled water in a conical flask. After that media was put in autoclave for 15 minutes for the purpose of sterilization at the temperature of 121°C and the pressure was kept at 15lbs. After cooling at 45°C and mixing well the media was

poured in sterilized petri plates again in laminar flow cabinet. Poured media was allowed to solidify (**Sarker *et al*., 2021**).

In this study four antibiotic like Azithromycin, Ciprofloxacin, Gentamicin, and Cefotaxime were used to check the resistance in *Salmonella* Spp. These antibiotics were selected as they most commonly used and *Salmonella* spp. has developed resistance against these antibiotics. Stock solutions of the antibiotics were prepared and then from these stock solution calculated concentrations of these antibiotics were added in the media after cooling it to a noticeable extent (**Hassan *et al*., 2018**).

2.5. Spreading of samples on media plates: After media preparation the next step was to spread the sample on agar plates. Each sugar cane juice sample (SJS) was to spread on one blank MacConkey, one blank SS and four plates of SS media supplemented with antibiotics. After spreading plates were kept in incubator at temperature of 37°C for overnight for the growth bacteria (**Akter *et al*., 2019**).

2.6. Identification of *Salmonella* spp.: After incubation petri plates were analyzed and bacterial cfu per ml of the media of each sample were counted on the basis of their colony morphology on SS agar and MacConkey. Antibiotic resistant *Salmonella* were also calculated and identified (**Sharma *et al*., 2020**).

2.7. Antibiotic resistance test: After identification *Salmonella* spp. antibiotic resistance test was performed by agar dilution method. Cfu of resistant bacterial species were counted per mL and per serving of sample (**Alim*et al*., 2022**).

RESULTS

Each sample was found to be contaminated with *Salmonella*, *Shigella* and *Escherichia coli*. These strains were identified on *SS* and MacConkey based on their colony morphology**.** Strains of *Salmonella* were identified by forming colonies with black center, sometimes colorless and transparent as well. While *Escherichia coli*strains on SS Agar were determined by forming pink red and small colonies. Likewise strains of *Shigella* on SS was identified by forming plain, clear and transparent colonies. Strains of *Salmonella* and *Shigella* on MacConkey agar were identified by forming light pink color colonies against background of rose pink color and transparent colonies as well as colorless respectively. While strains of *Escherichia coli* were found to be forming colonies of pink and red color.

On SS *Salmonella* cfu were found ranging from 4.5×10^4 to 2.45×10^5 per serving of sample that is 250 ml. On MacConkey Salm*onella* cfu were found to be ranging from 1.5×10^4 to 7.81×10^5 per serving of sample. Cefotaxime resistant *Salmonella* cfu were found ranging from 5×10^3 to 7.5×10^4 cfu per serving of sample. *Salmonella* spp. resistant to ciprofloxacin were highest in SJS2 that is 7×10^4 and lowest in SJS4 that is 2×10^4 cfu per sering of sample. No *Salmonella* was found resistant to azithromycin. Gentamicin resistant *Salmonella*were found to be highest in SJS1 that is 5×10^3 while lowest in SJS3 that is 1.5×10^4 cfu per serving of sample.

DISCUSSION

In this study SS and MacConkey media was used to check the prevalence of *Salmonella* spp. and antibiotic resistant *Salmonella* spp. isolated from fresh sugarcane juice obtained from various street vendors. Large number of investigations did their research to detect the presence of bacterial species such as *Salmonella* and *Shigella* from various road distributed fruit juices and drinks by using SS and MacConkey *Salmonella* and *Shigella* being selective and differential medium allows the isolation of *Salmonella* and *Shigella*from various food samples. SS agar is a variation of Leifson's Desoxycholate Citrate agar. It outperformed a variety of different media for the extraction of *Shigella* spp. and *Salmonella* spp. from different food samples. Composition of SS involves bilesalts, lactose, extracts of beef, peptone of casein and meat, deionizedwater, brilliant green, Sodium citrate and Sodium thiosulphate in particular concentrations as per standard condition (**Threlfall, 2002**).

In many affluent nations, the prevalence of multidrug-resistant *Salmonella* spp. strains has grown massively since 1990. The pandemic expansion of multi resistant *S. typhimurium* DT 104 strains, which itself appeared to have a global distribution, has been particularly noteworthy. The rising spectrum of resistance *in S. typhimurium* DT 104 was cause for concern, with strains with reduced susceptibility to ciprofloxacin becoming more common and causing significant infections in humans in many other countries. In many previous studies isolated strains of *Salmonella* were found to be resistant to certain antibiotics such as Penicillin, Azithromycin, Tetracycline and many Fluoroquinolones (**Nahidul-Islam, 2022**).

Sugarcane juice being cost effective, multinutritious, rich in taste is liked by people of all ages and of all groups in Pakistan. It has found to be contaminated with different bacterial strains like *Salmonella*, *Shigella* and *Escherichiacoli* (**Zhao *et al*., 2015**). In the present study sugar cane juice

from ten different vendors were accessed. It was estimated that sugarcane juice samples that were obtained from the vendors that were along the road were more contaminated such as SJS1, SJS4, SJS6 and SJS10. Also the poor hygienic conditions of the vendor also lead to contamination of the drink. Use of non-portable water for the preparation of juice and unwashed utensils might also be the reason of contamination the sugarcane juice samples. It was observed that in some of samples isolated bacterial spp. exceeded the safe limit of their consumption which in turn proved to be pathogenic.

On SS highest *Salmonella* cfu were found to be 2.45×10^5 per serving of sample in SJS4. On MacConkey highest *Salmonella* cfu were found to be 7.8×10^5 per serving of sample in SJS10. Similarly strains of *Salmonella*, *Shigella* and *Escherichiacoli* exhibited antibiotic resistance in some of the samples. Highest resistance was against ciprofloxacin by *Salmonella* spp. that was determined to be 7.0×10^4 cfu per serving of the sample in SJS2. To cefotaxime the resistance of *Salmonella* spp. were determined to be up to 7.5×10^4 cfu per serving of the sample in SJS10 Similarly resistance toward gentamicin was found to be 1.5×10^4 cfu per serving of sample in SJS3. And towards azithromycin resistance was determined to be 1.0×1^5 cfu per serving of sample in SJS1.

Ciprofloxacin and gentamicin resistant *Salmonella* spp. were found highest on the sample SJS1 as this sample was collected from the place with physical conditions like use of contaminated water for washing sugarcane and unhygienic conditions of vendors. Likewise high count of *Salmonella* and *E.coli* per serving was observed in SJS4 and this sample was obtained from vendor that was along the road and high traffic site. Cefotaxime resistant *Salmonella* were found in SJS6 and SJS10 that were obtained from near market area and unwashed utensils and juice machine was used for the preparation of juice.

CONCLUSION

Sugarcane drinks sold on Shahadra streets were found to be of poor bacterial purity, according to microbiological examinations. *Salmonella* contaminations were found in excess of permissible limits in the majority of the sugarcane juice samples tested. Microorganisms isolated, indicating inadequate sanitary and hygienic conditions at vendors/production locations. We urge regulatory bodies to strengthen microbiological food safety safeguards in the preparation of ready-to-eat commodities such as sugarcane juices. These findings also highlighted the potential risk of street-vendered beverages serving as a vehicle for the spread of antibiotic-resistant germs to the general public. To prevent the misuse of antibiotics, better regulatory frameworks must be implemented, and the surveillance system needs to be strengthened. Public awareness campaigns must to be held concurrently. Street food vendors must be subject to a licensing system, and only those who are qualified and have received training in fundamental food safety and hygiene should be granted a license. If effective measures to tackle antibiotic resistance are not taken right away, it will have a disastrous effect on public health in the subsequent decades. Apart from the essential aspects of food safety and hygienic standards, food handlers' food safety training should also emphasize the dangers of antibiotic-resistant spreading in food items.

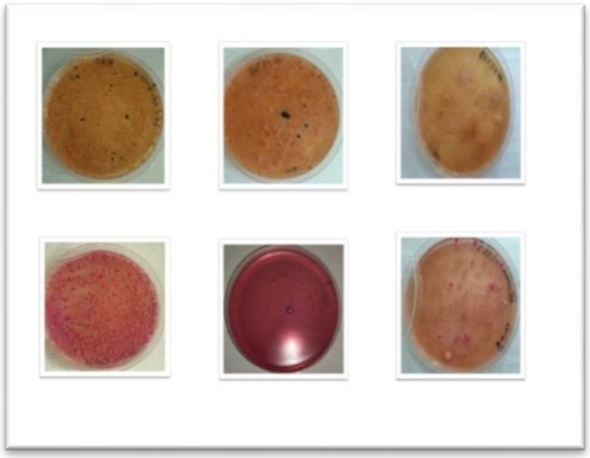

Figure-1: Appearance of colonies of *Salmonella*, *Shigella* and *Escherichia Coli* from 50µl of Sugarcane juice samples on SS and MacConkey Agar after overnight in cubation at 37° C.

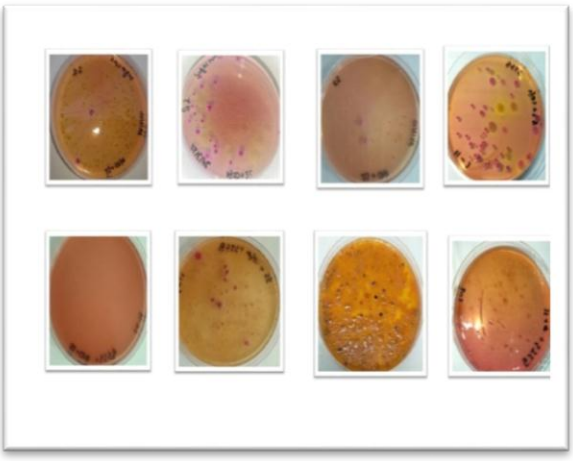

Figure-2: Appearance of azithromycin resistant colonies of *Salmonella*, *Shigella* and E.coli from 0µl of Sugarcane juice samples on SS Agar after overnight incubation at 37° C.

Figure-3: Appearance of gentamicin resistant colonies of *Salmonella*, *Shigella* and *Escherichia coli* from 50µl of Sugarcane juice samples on SS Agar after overnight incubation at 37° C.

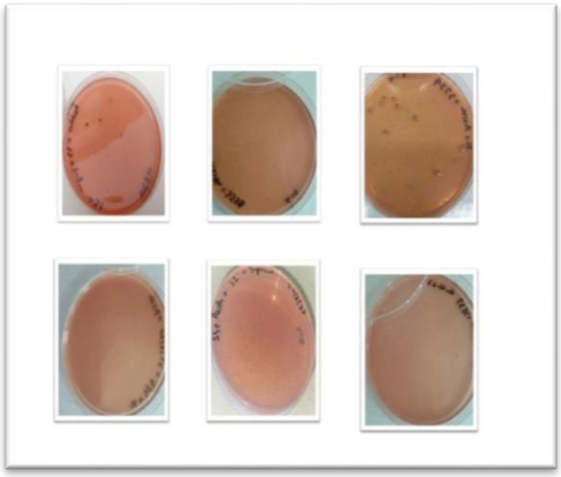

Figure-4: Appearance of ciprofloxacin resistant colonies of *Salmonella*, *Shigella* and *E.coli* from 50µL of Sugar cane juice samples on SS agar after overnight incubation at 37°C

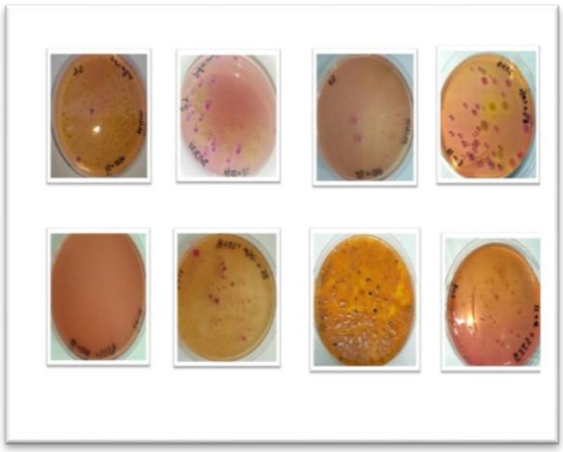

Figure-5: Appearance of cefotaxime resistant colonies of *Salmonella*, *Shigella* and *Escherichia coli* from 50µl of Sugarcane juice samples on SS Agar after overnight incubation at 37° C.

Table- 1: Prevalence of *Salmonella* spp. on SS agar

Serial Number	Sugarcane juice samples (50µL)	*Salmonella* (cfu)		*Shigella* (cfu)		*E. coli* (cfu)	
		Per mL	Per serving(250mL)	Per mL	Per serving (250mL)	Per mL	Per serving (250mL)
1	SJS1	240	6.0×10^4	660	1.6×10^5	1580	3.9×10^5
2	SJS2	180	4.5×10^4	1140	2.8×10^5	60	1.5×10^4
3	SJS3	500	1.25×10^5	460	1.15×10^5	1060	2.6×10^5
4	SJS4	980	2.45×10^5	120	3×10^4	100	2.5×10^4
5	SJS5	260	6.5×10^4	180	4.5×10^4	340	8.5×10^4
6	SJS6	460	1.1×10^5	0	0	220	5.5×10^4
7	SJS7	0	0	120	3×10^4	180	4.5×10^4
8	SJS8	240	6.0×10^4	1860	4.6×10^5	60	1.5×10^4
9	SJS9	240	6.0×10^4	60	1.5×10^4	120	3×10^4
10	SJS10	840	2.1×10^5	80	2×10^4	160	4×10^4

Table-2: Prevalence of *Salmonella* spp. on MacConkeyagar

Serial Number	Sugarcane juice samples (50 µL)	*Salmonella* cfu		*Shigella* (cfu)		*E. coli* (cfu)	
		Per mL	Per serving (250mL)	Per mL	Per serving (250 mL)	Per mL	Per serving (250mL)
1	SJS1	1980	4.9×10^5	0	0	0	0
2	SJS2	1260	3.15×10^5	0	0	0	0
3	SJS3	2060	5.15×10^5	260	6.5×10^4	260	6.5×10^4
4	SJS4	380	9.5×10^4	1060	2.6×10^5	3840	9.6×10^5
5	SJS5	1640	4.1×10^4	640	1.6×10^5	280	7×10^4
6	SJS6	60	1.5×10^4	0	0	0	0
7	SJS7	1740	4.35×10^5	180	4.5×10^4	340	8.5×10^4
8	SJS8	460	1.15×10^5	0	0	320	8×10^4
9	SJS9	1720	4.310^5	0	0	260	6.5×10^4
10	SJ10	3120	7.810^5	320	8×10^4	1400	3.5×10^5

Table 1.3. Prevalence of bacterial spp. resistant to azithromycin

Serial Number	Sugarcane juice samples (50 µL)	*Salmonella* (cfu) per serving	*Shigella* (cfu) per serving	*E. coil* (cfu) per serving
1	SJS1	1.0×10^5	2.5×10^4	5×10^3
2	SJS2	0	0	0
3	SJS3	0	0	0
4	SJS4	0	0	1.5×10^4
5	SJS5	0	0	1×10^4
6	SJS6	0	0	0
7	SJS7	0	0	1.5×10^4
8	SJS8	0	7×10^4	0
9	SJS9	0	8.5×10^4	4.5×10^4
10	SJS10	0	2×10^4	1.3×10^5

Table 4: Prevalence of bacterial spp. resistant to gentamicin

Serial Number	Samples (50 µL)	*Salmonella* (cfu) per serving of sample	*Shigella* (cfu) per serving	*E. coli* (cfu) per serving
1	SJS1	5.0×10^3	5×10^3	2×10^4
2	SJS2	0	1.5×10^4	1.1×10^5
3	SJS3	1.5×10^4	0	0
4	SJS4	0	0	1.9×10^5
5	SJS5	0	4.5×10^4	2×10^5
6	SJS6	0	0	0
7	SJS7	0	0	0
8	SJS8	0	5.5×10^4	0
9	SJS9	0	0	2.5×10^5
10	SJS10	0	0	5.5×10^4

Table 1.5. Prevalence of bacterial spp. resistant to ciprofloxacin

Serial Number	Sample (50µL)	*Salmonella* (cfu) per serving of sample	*Shigella* (cfu) per serving	*E. coli* (cfu) per serving
1	SJS1	6.5×10^4	1.1×10^5	1.7×10^5
2	SJS2	7.0×10^4	9.5×10^4	2.1×10^5
3	SJS3	0	3.5×10^4	7.5×10^4
4	SJS4	2.0×10^4	0	1.9×10^4
5	SJS5	0	0	0

6	SJS6	0	0	0
7	SJS7	0	0	1×10^4
8	SJS8	0	0	5.4×10^4
9	SJS9	0	1.4×10^5	2.7×10^5
10	SJS10	0	1.8×10^5	1×10^5

Table 1.6. Prevalence of bacterial spp. resistant to cefotaxime

Serial Number	Sample (50 µL)	*Salmonella* (cfu) per serving of sample	*Shigella* (cfu) per serving	*E. coli* (cfu) per serving
1	SJS1	5.0×10^3	3.6×10^5	1×10^4
2	SJS2	0	1.1×10^5	1.2×10^5
3	SJS3	0	2.1×10^5	6×10^4
4	SJS4	0	0	1.65×10^5
5	SJS5	0	6.5×10^4	1.1×10^5
6	SJS6	0	1.5×10^3	9.5×10^4
7	SJS7	0	0	0
8	SJS8	0	3.8×10^5	6×10^4
9	SJS9	7.0×10^4	0	0
10	SJS10	7.5×10^4	1.1×10^5	0

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