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A Study on the Effect of Preservation on the Microbial Growth in Fruit Juices

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ABSTRACT

Traditionally fruit juices and fruit products are considered as microbiologically safer than other unprocessed foods. Fruit juices are popular drinks as they contain antioxidants, vitamins, and minerals that are essential for human being and play an important role in the prevention of heart diseases, cancer, and diabetes. The objective of this study is to evaluate microbiological safety and quality of freshly prepared juices and preserved juices. Thirty fruit juice samples were collected from different areas in and around Hyderabad .Some of the packed juice products were also collected for the study. The microorganisms isolated from both fresh street vended juices and packed liquid products were identified as Staphylococcus spp, Lactobacillus spp, Cornybacterium spp, Micrococcus spp, Pseudomonas spp by biochemical tests. Pathogens like Cornybacterium, Staphylococcus were also isolated. On preservation of fruit juices for 5 days the microbial load increased when compared to fresh juice samples. The viable count of sample increases from 4 x 10^0 to 610 x 10^0 CFU/ml. The Antimicrobial susceptibility testing is performed to check the sensitivity of the isolated pathogenic organisms and it was observed that Staphylococcus *aureus* was sensitive to all the antibiotics while cornybacterium spp was sensitive to few antibiotics like Gentamicin, Roxythromycin, Cefadroxil, and Azithromycin and resistant to Amikacin, Ampiclox, Ciprofloxacin, Clarithromicin, Cefotaxime, Sparfloxacin.

Keywords: Fresh Juices, Packed Juices, Preservation

I. INTRODUCTION

Fruit juices are very nutritive, invorgating and non-alcoholic beverage, which is very well liked throughout the world [1]. Unpasteurized fruit juice is defined as the product produced by pressing or squeezing of the fruits [2]. These juices can be used in their natural concentration or in processed form. They are very scrumptious and palatable and they have most of the minerals like calcium magnesium, phosphorus, and sodium and vitamin c [1]. Extracted juices from fruits contain most substances, which are foundin the original ripe and sound fruit from which the juices is made [2]. However, these processed juices contain mainly water, sugar, preservatives, colour, fruit pulps and other additives as ingredients and must maintain sanitary standard. The most commonly used preservatives are benzoic acid, sorbic acid, or sulphur dioxide. Natural colours such as anthocyanins and betanin are used. Acid is an essential universal constitution of soft drinks. The most commonly used is citric acid [1].

Most fruit juices contain sufficient nutrients that could support microbial growth. Several factors encourage, prevent, or limit the growth of microorganisms in juices; the most important are water activity, pH, hygienic practice and storage temperature and concentration of preservative. Storage of products at refrigerator temperature or bellow is not always best for the maintenance of desirable quality of some fruit. Water used for juice preparation can be a major source of microbial contaminants such as total coliforms, faecal coliforms, faecal streptococci, etc. Environmental formites may also make the fruits unsafe and these may have a role in spreading of Salmonella, Shigella, Vibrio, Escherichia coli, and other diseases causing as well as fruits spoilage types.

Spoilage yeasts, such as Saccharomyces cerevisiae, Candida lipolytica and Zygosaccharomyces spp. can tolerate acidic environments. It should also be noted that changes in pH could transform a food into one, which can support growth of pathogens [1]. Pathogenic bacteria contribute to other globally important diseases such as Pneumonia, which can be caused by bacteria such as Streptococcus and Pseudomonas. Pathogenic bacteria also cause infections such as tetanus, typhoid fever, diphtheria, syphilis and leprosy. These bacteria are also the cause of high infant mortality rates in developing countries [12].

The quality of soft drinks is strictly maintained in developed countries under some law and regulation but in many developing and under developed countries; the manufacturer is not concern about the microbiological safety and hygiene of soft drinks because of negligence of law. Thus, the transmission of somehuman diseases through juice and other drinks are considered a serious problem in recent years [1].

II. METHODS AND MATERIAL

1. Sample collection

A total of 30 samples from different locations of Hyderabad were collected. Samples were collected in a sterile container and tested within an hour after procurement.

2. Isolation of Bacteria From the Samples

0.1 ml of fresh juice sample was taken and inoculated onto nutrient agar medium [11] by spread plate technique [3]. The plates were incubated at 37^{o}C for 24 hours. The samples were further preserved in refrigerator for 5days and 0.1ml of each sample was taken and was spread over nutrient agar medium and incubated at 37^{o}C for 24 hours.

3. Total Viable Count

The discrete colonies observed following incubation period were enumerated by viable count method [3]

4. Morphological and Biochemical Characterization

The isolated microorganisms were identified by Gram staining[11] using Bergey's manual [4] .The isolates were characterized by biochemical tests viz. IMViC reactions i.e. indole test, Methyl Red test, Voges-Proskauer test and Citrate utilization test, Lactose and Glucose fermentation Reaction test by standard method using Bergey's manual [4].

5. Antimicrobial Susceptibility Testing

Antibiotic sensitivity testing was performed using Kirby-Bauer disc diffusion method(NCCLS, 2001) [10] The sensitivity and resistance of the pathogenic bacteria to antibiotics like Gentamicin, Roxythromycin, Cefadroxil, Azithromycin, Amikacin, Ampiclox, Ciprofloxacin, Clarithromicin, Cefotaxime and Sparfloxacin was determined by measuring the diameter of zone of inhibition and then compared with the standard diameters that were installed in the standard scales.

III. RESULTS AND DISCUSSION

In spite of the potential benefits offered by fruit juices, concerns over their safety and quality have been raised. Freshly squeezed fruit juices have little or no process steps that reduce pathogen levels, if contaminated [5].
In the present study, 30 fruit juice samples (20 samples from street vender and 10 packed juices) were examined for microbiological analysis.).0.1ml of the sample when inoculated onto nutrient agar media and incubated at 37°C discrete colonies were observed. Morphological identification and biochemical tests revealed the presence of pathogenic and non-pathogenic bacteria(Table1 &2). The pathogenic isolates identifies were *Staphylococcus aureus* and *cornybacterium spp.*The microbial load was determined by viable count method [3] (Figure 1,2).The viable count of pathogenic bacteria is found to be more in fresh street vended samples than in processed samples, this is because of unhygienic maintenance during preparing the juice [3] (Figure3&4). A number of studies showed the microbiological analysis of street vended and packaged juices cause growth of coli forms like faecal coliforms, *E.coli, S. aureus* and *Vibrio cholera.* Many factors are responsible for contamination of freshly squeezed fruit juices. Most fruit contains bacterial counts of 1 X 105 cfu/cm^2 on their surface [7] [8] [9] .Improper washing of fruits add these bacteria to juices leading to contamination. In addition lack of appreciation of basic safety issues by vendors contribute to augmentation of the microbial loads.

These include use of crude stands and carts, unavailability of running water for dilution and washing, prolonged preservation without refrigeration, unhygienic surroundings with swarming flies and airborne dust [6].The literature also reveals that microbial quality of ice manufactured for use to cool foods and drinks could be a cause of concern [5]. The microbial safety of commercial ice used in drinks was evaluated by Lateef et al. (2006) in Nigeria and it was found that microbial loads of these ice samples ranged from 1.88-3.20 X 104 cfu/ml which was largely above the recommended loads of more than 500 and 1000 cfu/ml for ice obtained from manufacturing plants and retail outlets respectively.

Most of the fruit juice samples which were preserved for 5 days showed equal or much higher viable count than the permitted count [3] (Figure 2). There was equal number of bacterial load in both street vended and packed juice sample. On 0^{th} day sample 17 showed least viable count and the organism which is high in number was Lactobacillus spp, (Table 1) very few fresh samples showed presence of pathogenic bacteria. While the same sample on 5^{th} day showed highest viable count (i.e.610) and pathogenic organisms like Staphylococcus and Cornybacterium spp. were high in number (Table 2) Variation in viable count and change in the organism in both 0^{th} and 5^{th} day sample is because of preservation at refrigerated conditions.

After preserving at low temperatures for 5 days the organisms like Cornybacterium spp, Staphylococcus spp., Lactobacillus spp., Micrococcus spp., *Proteus vulgaris*, *Citobacter diversis* and *Edwardsiella tarda* were isolated from both packed juices and street vended juices. Of them the pathogenic organisms were Cornybacterium spp and Staphylococcus spp. According to the literature Lactobacillus which was isolated from fruit juices is a Gram positive rod shaped, non-spore forming bacteria, member of lactic acid bacteria. Lactobacillus spp produce hydrogen peroxide which inhibits the growth and virulence of fungal pathogen Candida *albicans* in vitro and in vivo [13]. Some Lactobacillus spp. are used as starter cultures in industry for controlled fermentation in the production of yoghurt, cheese, sauerkraut, pickles, beer, Kimchi, cocoa, and other fermented foods as well as animal feed. the antibacterial and antifungal activity of Lactobacillus spp. rely on production of bacteriocins and low molecular weight compounds that inhibits these compounds [14]. Micrococcus is a gram-positive spherical cells ranging about 0.5 to 3 micrometers in diameter and typically appear in tetrads. Most commonly occurs in soil, water and dust. They are likely involved in detoxification and biodegradation of many other environmental pollutants. *Proteus vulgaris* is a rod shaped Gram-negative bacterium. It can be found in soil, water and fecal matter. An opportunistic pathogen to humans, known to cause wound infection and urinary tract infection. *Citobacter* spp. is a Gram negative coliform bacteria. They are differentiated by their ability to convert trytophan to indole, ferment lactose and use malonate. They are found in soil, water, waste water and in human intestine. *Edwardsiella tarda* is small, motile, gram-negative, straight rod, cause infection in Channel fish and eels. It is the cause of periodic infections for various animals within zoos [15]. Staphylococcus spp. is an gram positive cocci and an opportunistic pathogen that can cause a variety of self-limiting to life threatening diseases in humans. The bacteria are a leading cause of food poisoning, resulting from the consumption of food contaminated with enterotoxins. *Cornybacterium keutscari* Gram positive, small, rod shaped bacteria. It mainly causes systemic abscessation in rodents similiar to caseous lymphadenitis in sheep. Previously called *Cornybacterium murium*. The disease produced by infection of Cornybacterium Keutscari is also known as Pseudotuberculosis [16]. *Cornybacterium xerosis*, an organism frequently responsible for human infection is a part of normal flora of the nasopharynx and skin [17]. Humans may be infected with different microorganism when they consume contaminated foods. To treat those infections antibiotics are used. The administration of a particular antibiotic depends on its susceptibility towards the drug which can be determined by Antimicrobial susceptibility test. The antimicrobial activity of different antibiotics like Gentamicin, Roxythromycin, Cefadroxil, Azithromycin, Amikacin, Ampiclox, Ciprofloxacin, Clarithromicin, Cefotaxime and Sparfloxacin against the isolated pathogenic organisms was determined (Table 3,4,5). It was observed that Staphylococcus spp was sensitive to all the available antibiotics like Gentamicin, Roxythromycin, Cefadroxil, Azithromycin, Amikacin, Ampiclox, Ciprofloxacin, Clarithromicin, Cefotaxime and Sparfloxacin .Cornybacterium spp was susceptible to Gentamicin, Roxythromycin, Cefadroxil, Azithromycin and resistant to Amikacin, Ampiclox, Ciprofloxacin, Clarithromicin, Cefotaxime,

Cefuroxime, Cefoperazone and Sparfloxacin. The zone diameter was found to be 10 mm , 20 mm, 14 mm, 12 mm, 15 mm, 11 mmfor cornybacterium xerosis and the zone diameter for Cornybacterium leutscari is 17mm, 19mm, 30mm, 13mm, 26mm, 28mm, 20mm, 25mm.

Table 1: Identification and Biochemical test of isolated organism using Bergey's manual for 0^{th} day samples

Sample	Gram character	Identification test						Organism
		Catalase	Glucose fermentation	Starch hydrolysis	Indole	H2S	Urease	
Sample 1	**Gram +ve bacilli**	+	-	+	-	-	-	*Cornybacterium keutscari*
Sample 2	**Gram +ve bacilli**	-	+ (Acid & Gas)	-	-	-	-	*Lactobacillus fermenti*
Sample 3	**Gram +ve bacilli**	-	+ (Acid & Gas)	-	-	-	-	*Lactobacillus fermenti*
Sample 4	**Gram +ve bacilli**	+	-	+	-	-	-	*Cornybacterium keutscari*
Sample 5	**Gram +ve bacilli**	-	+ (Acid & Gas)	-	-	-	-	*Lactobacillus fermenti*
Sample 6	**Gram +ve bacilli**	-	+ (Acid &mannitol +)	-	-	-	-	*Lactobacillus casei*
Sample 7	**Gram +ve bacilli**	-	+ (Acid &mannitol -)	-	-	-	-	*Lactobacillus delbrueckii*
Sample 8	**Gram +ve bacilli**	-	+ (Acid & Gas)	-	-	-	-	*Lactobacillus fermenti*
Sample 9	**Gram +ve bacilli**	-	+ (Acid & Gas)	-	-	-	-	*Lactobacillus fermenti*
Sample 10	**Gram +ve bacilli**	-	+ (Acid &mannitol -)	-	-	-	-	*Lactobacillus delbrueckii*
Sample 11	**Gram +ve bacilli**	-	+ (Acid &mannitol +)	-	-	-	-	*Lactobacillus casei*
Sample 12	**Gram +ve bacilli**	-	+ (Acid &mannitol +)	-	-	-	-	*Lactobacillus casei*
Sample 13	**Gram -ve bacilli**	-	-	-	+	+	+	*Proteus vulgaris*
Sample 14	**Gram -ve bacilli**	-	-	-	- (MR +,VP -)	+	-	*citrobacterfreundii*
Sample 15	**Gram -ve bacilli**	-	-	-	+ (Citrate +)	-	-	*citrobacterdiversis (VP -)*
Sample 16	**Gram +vecocci**	+	-	-	-	-	-	*Micrococcus luteus*
Sample 17	**Gram +vecocci**	+	+	-	-	-	-	*Micrococcus varians*

Sample 18	**Gram +vecocci**	+	+	-	-	-	-	*Micrococcus varians*
Sample 19	**Gram +vecocci**	+	-	-	-	-	-	*Micrococcus luteus*
Sample 20	**Gram -ve bacilli**	-	-	-	+	+	-	*Edwardsiellatarda*
Sample 21	**Gram -ve bacilli**		+	-	-	-	-	*Pseudomonas spp (citrate +)*
Sample 22	**Gram -ve bacilli**	-	-	-	+	+	-	*Edwardsiellatarda*
Sample 23	**Gram +vecocci**	+	-	-	-	-	-	*Staphylococcus aureus*
Sample 24	**Gram +vecocci**	+	-	-	-	-	-	*Micrococcus luteus*
Sample 25	**Gram +vecocci**	+	-	-	-	-	-	*Staphylococcus aureus*
Sample 26	**Gram +ve bacilli**	-	+ (Acid &mannitol -)	-	-	-	-	*Lactobacillus delbrueckii*
Sample 27	**Gram +ve bacilli**	-	+ (Acid &mannitol -)	-	-	-	-	*Lactobacillus delbrueckii*
Sample 28	**Gram +ve bacilli**	-	+ (Acid &mannitol +)	-	-	-	-	*Lactobacillus casei*
Sample 29	**Gram +ve bacilli**	-	+ (Acid &mannitol +)	-	-	-	-	*Lactobacillus casei*
Sample 30	**Gram -ve bacilli**	-	-	-	+ (Citrate +)	-	-	*citrobacterdiversis (VP -)*

Table 2: Identification and Biochemical test of isolated organism using Bergey's manual for 5th sample

Sample	**Gram character**	**Identification test**						**Organism**
		Catalase	**Glucose fermentation**	**Starch hydrolysis**	**Indole**	**H2S**	**Urease**	
Sample 1	**Gram +ve bacilli**	+	-	+	-	-	-	*Cornybacterium keutscari*
Sample 2	**Gram +ve bacilli**	+	-	-	-	-	-	*Cornybacterium xerosis*
Sample 3	**Gram +ve bacilli**	+	-	+	-	-	-	*Cornybacterium keutscari*
Sample 4	**Gram +ve bacilli**	-	+ (Acid & Gas)	-	-	-	-	*Lactobacillus fermenti*
Sample 5	**Gram +ve bacilli**	+	-	-	-	-	-	*Cornybacterium xerosis*
Sample 6	**Gram +ve bacilli**	-	+ (Acid & Gas)	-	-	-	-	*Lactobacillus fermenti*

Sample 7	**Gram +ve bacilli**	-	+ (Acid &mannitol +)	-	-	-	-	*Lactobacillus casei*
Sample 8	**Gram +ve bacilli**	+	-	+	-	-	-	*Cornybacterium keutscari*
Sample 9	**Gram +ve bacilli**	+	-	+	-	-	-	*Cornybacterium keutscari*
Sample 10	**Gram +ve bacilli**	+	-	+	-	-	-	*Cornybacterium keutscari*
Sample 11	**Gram +ve bacilli**	-	+ (Acid &mannitol +)	-	-	-	-	*Lactobacillus casei*
Sample 12	**Gram +vecocci**	+	-	-	-	-	-	*Staphylococcus aureus*
Sample 13	**Gram +ve bacilli**	+	-	-	-	-	-	*Cornybacterium xerosis*
Sample 14	**Gram +ve bacilli**	-	+ (Acid &mannitol +)	-	-	-	-	*Lactobacillus casei*
Sample 15	**Gram +ve bacilli**	-	+ (Acid & Gas)	-	-	-	-	*Lactobacillus fermenti*
Sample 16	**Gram +ve bacilli**	-	+ (Acid &mannitol -)	-	-	-	-	*Lactobacillus delbrueckii*
Sample 17	**Gram +ve bacilli**	-	+ (Acid & Gas)	-	-	-	-	*Lactobacillus fermenti*
Sample 18	**Gram +ve bacilli**	+	-	-	-	-	-	*Cornybacterium xerosis*
Sample 19	**Gram +ve bacilli**	-	+ (Acid &mannitol +)	-	-	-	-	*Lactobacillus casei*
Sample 20	**Gram -ve bacilli**	-	-	-	+	+	-	*Edwardsiellatarda*
Sample 21	**Gram -ve bacilli**		+	-	-	-	-	*Pseudomonas spp (citrate +)*
Sample 22	**Gram -ve bacilli**	-	-	-	+	+	-	*Edwardsiellatarda*
Sample 23	**Gram +vecocci**	+	-	-	-	-	-	*Staphylococcus aureus*
Sample 24	**Gram +vecocci**	+	-	-	-	-	-	*Staphylococcus aureus*
Sample 25	**Gram +ve bacilli**	-	+ (Acid &mannitol -)	-	-	-	-	*Lactobacillus delbrueckii*
Sample 26	**Gram +vecocci**	+	-	-	-	-	-	*Staphylococcus aureus*
Sample 27	**Gram +ve bacilli**	+	-	+	-	-	-	*Cornybacterium keutscari*
Sample 28	**Gram +ve bacilli**	+	-	-	-	-	-	*Cornybacterium xerosis*

Sample 29	**Gram +ve bacilli**	-	+ (Acid &mannitol -)	-	-	-	-	*Lactobacillus delbrueckii*
Sample 30	**Gram +ve bacilli**	-	+ (Acid &mannitol -)	-	-	-	-	*Lactobacillus delbrueckii*

Total Viable Count

The microbial load of freshly collected samples(0^{th} day) and preserved samples(5^{th} day) was determined by viable count method.(Fig1,2).The number of viable cells increased on preservation of juice samples. Sample 22 shows the highest number of viable count on 0^{th} day (i.e. 348) and samples 2,4,8,10,14,18,23,24 showed least no of viable count. Whereas on 5^{th} day, sample 17 shows highest number of viable count (i.e.610) and samples such as 1,4,6,8,15,16 18, showed least number of viable count

Figure 1 : Viable count of organism on 0^{th} day

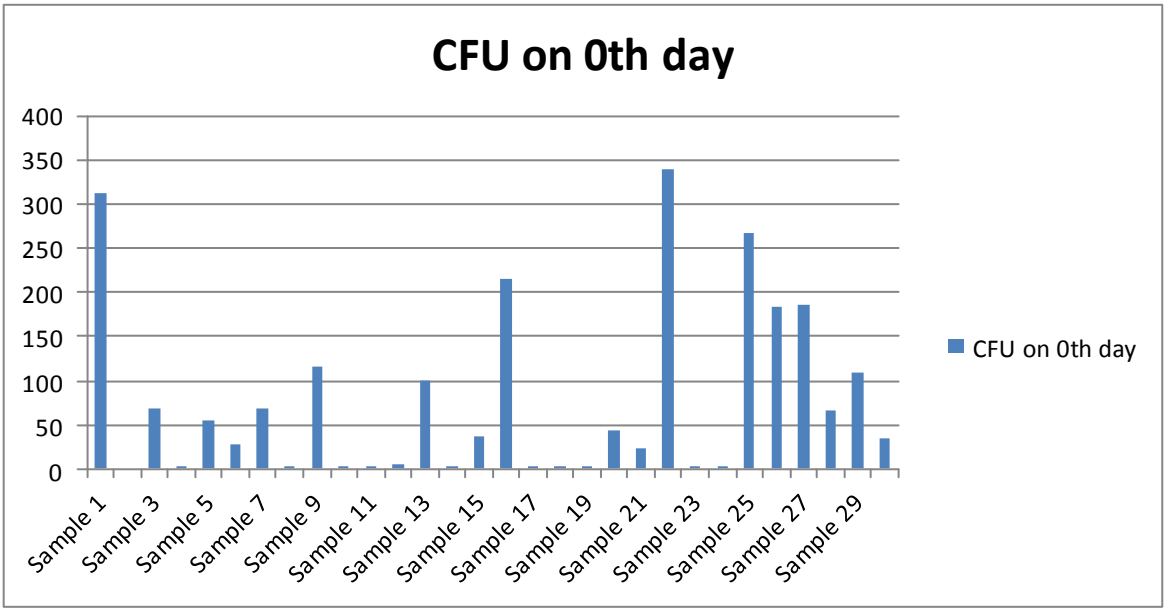
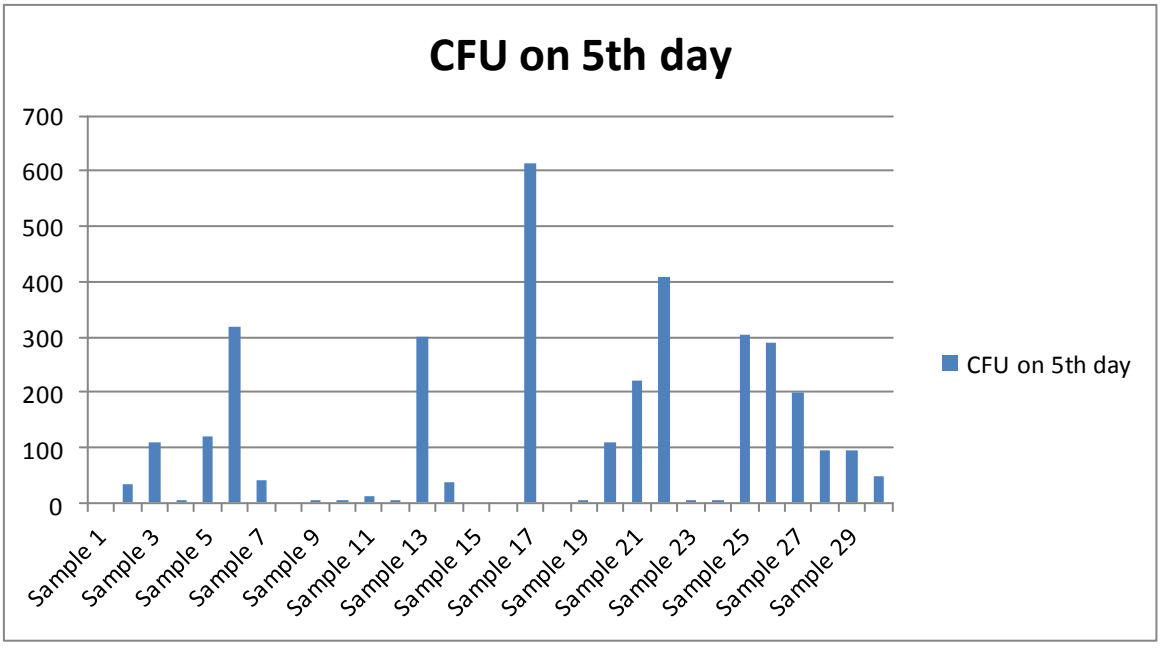


Figure 2 : Viable count of organism on 5^{th} day



On 0th day Lactobacillus fermentii, Lactobacillus casei and Lactobacillus delbrueckii were high in occurrence and organisms like Proteus vulgaris, Citrobacter freundii and Citrobacter diversus were less in occurrence compared to other organism. On 5th day Cornybacterium keutsceri, Lactobacillus delbrueckii, Cornybacterium xerosis and Staphylococcus aureus were high in occurrence (Fig 3,4).

Figure 3: Total analysis of microorganism 0th day

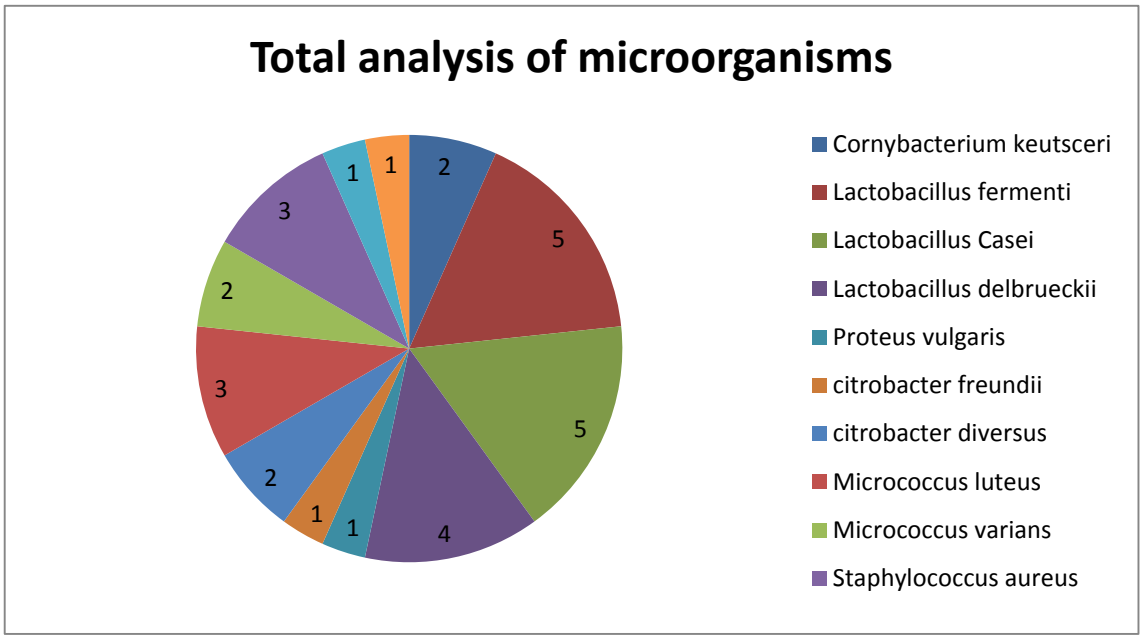
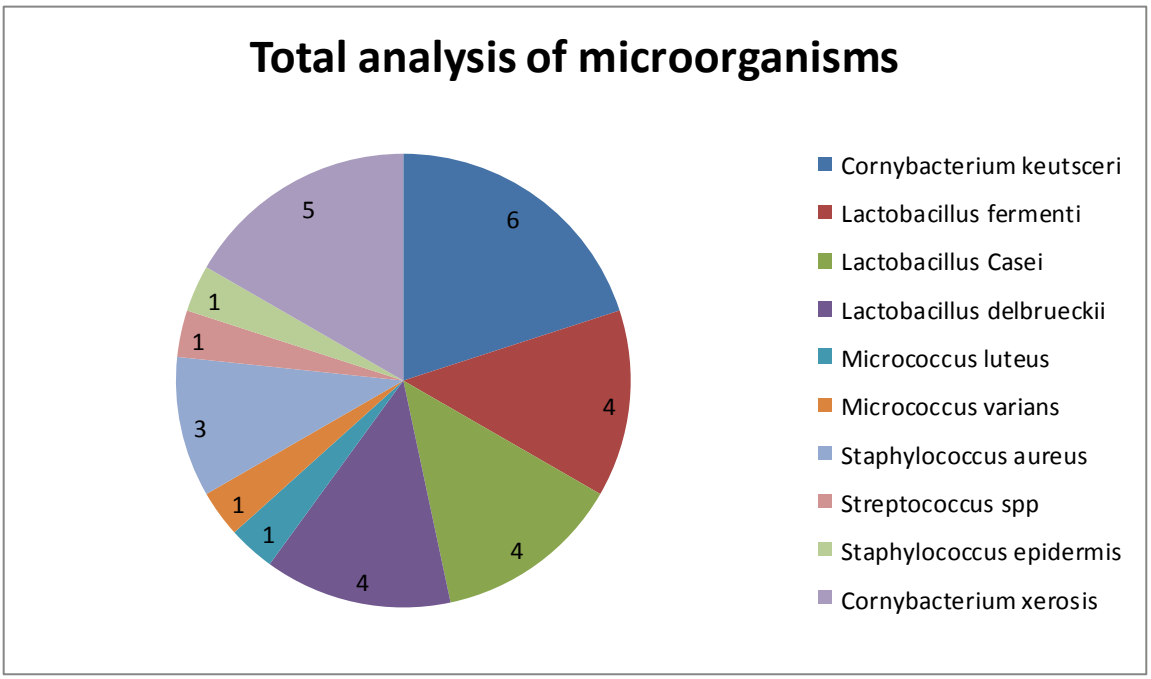


Figure 4 : Total analysis of microorganism 5th day



Antimicrobial Activity

Table 3 : Antimicrobial activity of commercially available antibiotic discs on *Staphylococcus aureus*

ANTIMICROBIAL AGENT	CODE	DISC CONTENT	DIAMETER OF ZONE OF INHIBITION (CM)			ANTIBIOTIC SENSITIVITY
			Resistant	Intermediate	Susceptible	
Amikacin	AN	30 mcg	14	15-16	17	22
Ampiclox	ACX	20 mcg	22	23-27	28	22
Ciprofloxacin	CIP	5 mcg	15	16-20	21	30
Clarithromycin	CLR	15 mcg	13	14-17	18	20
Cefotaxime	CF	30 mcg	14	15-22	23	Sensitive
Sparfloxacin	SF	5 mcg	15	16-18	19	Sensitive
Cefuroxime	CR	30 mcg	14	15-17	18	Sensitive
Cefoperazone	CFP	75 mcg	15	16-20	21	22
Gentamicin	G	10 mcg	12	13-14	15	Sensitive
Roxythromycin	RX	15 mcg	13	14-17	18	Sensitive
Cefadroxil	CD	30 mcg	14	15-17	18	Sensitive
Azithromycin	AZ	15 mcg	13	14-17	18	Sensitive

Note:*Staphylococcus aureus* showed sensitivity against all the antimicrobial agent available in the disc.

Table 4: Antimicrobial activity of commercially available antibiotic discs on *Cornybacterium xerosis*

ANTIMICROBIAL AGENT	CODE	DISC CONTENT	DIAMETER OF ZONE OF INHIBITION (CM)			ANTIBIOTIC SENSITIVITY
			Resistant	Intermediate	Susceptible	
Amikacin	AN	30 mcg	14	15-16	17	10
Ampiclox	ACX	20 mcg	22	23-27	28	20
Ciprofloxacin	CIP	5 mcg	15	16-20	21	14
Clarithromycin	CLR	15 mcg	13	14-17	18	12
Cefotaxime	CF	30 mcg	14	15-22	23	14
Sparfloxacin	SF	5 mcg	15	16-18	19	15
Cefuroxime	CR	30 mcg	14	15-17	18	11
Cefoperazone	CFP	75 mcg	15	16-20	21	14
Gentamicin	G	10 mcg	12	13-14	15	Sensitive
Roxythromycin	RX	15 mcg	13	14-17	18	Sensitive
Cefadroxil	CD	30 mcg	14	15-17	18	Sensitive
Azithromycin	AZ	15 mcg	13	14-17	18	Sensitive

Note: *Cornybacterium xerosis* showed sensitivity against Gentamicin, Roxythromycin, Cefadroxil, and Azithromycin

Table 5 : Antimicrobial activity of commercially available antibiotic discs on *Cornybacterium keutsceri*

ANTIMICROBIAL AGENT	CODE	DISC CONTENT	DIAMETER OF ZONE OF INHIBITION			ANTIBIOTIC SENSITIVITY
			Resistant	Intermediate	Susceptible	
Amikacin	AN	30 mcg	14	15-16	17	17
Ampiclox	ACX	20 mcg	22	23-27	28	19
Ciprofloxacin	CIP	5 mcg	15	16-20	21	30
Clarithromycin	CLR	15 mcg	13	14-17	18	13
Cefotaxime	CF	30 mcg	14	15-22	23	26
Sparfloxacin	SF	5 mcg	15	16-18	19	28
Cefuroxime	CR	30 mcg	14	15-17	18	20
Cefoperazone	CFP	75 mcg	15	16-20	21	25
Gentamicin	G	10 mcg	12	13-14	15	Sensitive
Roxythromycin	RX	15 mcg	13	14-17	18	Sensitive
Cefadroxil	CD	30 mcg	14	15-17	18	Sensitive
Azithromycin	AZ	15 mcg	13	14-17	18	Sensitive

Note: *Cornybacteriumkeutsceri* is sensitive against Gentamicin, Roxythromycin, Cefadroxil, Azithromycin

IV. CONCLUSION

Juices prepared from fresh fruits and processed juices, on preservation cause microbial growth which is potentially hazardous to public health [2]. In this study, on preservation of fresh and processed juices for 5 days caused the growth of pathogenic organism.The presence of pathogenic microorganisms in juices is a clear indication of food borne outbreaks [2].

To prevent the disease caused by the pathogenic organism, commercially available antimicrobial agents were used and inhibited the growth. In future, natural antimicrobials from plants, fruits and vegetables can be used to control spoilage and growth of pathogenic microorganisms in juices.

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VI. REFERENCES

[1] M AbulBasar and SabitaRezwanaRahman "Assessment of Microbiological Quality of Processed Fruit Juice" Bangladesh J Microbiol, Volume 24, Number 2, December 2007, 166-168

[2] Kamal Rai Aneja, Romika Dhiman, Neeraj Kumar Aggarwal,Vikas Kumar, and Manpreeet Kaur " Microbes Associated with Freshly Prepared Juices of Citrus and Carrots" International Journal of Food Science Volume 2014,International journel of food science, 2014; volume 2014

[3] Rashed, N,Md. Aftab, U, Mrityunjoy, A. and Md. Azizul, H., M.Majibur, R.Saurab, K. M. "Microbiological study of vendor and packed fruit juices locally available in Dhaka city, Bangladesh" International Food Research Journal 20(2): 1011-1015 (2013)

[4] Identification flow charts,Bergey's Manual of Determinative Bacteriology.

[5] Durgesh P. MahaleRanjana G. Khade, Varsha K. Vaidya "Microbiological Analysis of Street Vended Fruit Juices from Mumbai City, India" Internel Journal of Food Safety, Vol.10, 2008, p31-34

[6] Lewis JE, Thompson P, Rao BVVBN, Kalavati C and Rajanna B. 2006.Human bacteria in street vended fruit juices: A case study of Visakhapatnam City, India.Internet Journal of Food Safety. 8:35-38.

[7] Al-Jedah JH and Robinson RK. 2002. Nutritional Value and Microbiological Safety of Fresh Fruit Juices sold through Retail Outlets in Qatar. Pakistan Journal of Nutrition. 1 (2): 79-81.

[8] Harrigan WF. 1998. Laboratory Methods in Food Microbiology. Academic Press London.

[9] Splittstosser DF. 1979. Fruits and Fruit Products. In: Food & Beverage Mycology. Ed. Beuchat, LR. Avi Publishing Co. Inc, Westport, Connecticut.

[10] PoonamU.Sharma "Bacteriological analysis of street vended fruit juicesavailable in Vidarbha" International Journel of Current Microbiology and Applied Sciences ISSN: 2319-7706 Volume 2 Number 5 (2013) pp. 178-183

[11] Ashok Kumar, VarunBhushan, ShikhaVerma, GauravSrivastav and Sushil Kumar "Isolation and Characterization of Microorganisms Responsible for Different Types of Food Spoilages"International Journal of Research in Pure and Applied Microbiology 2011;1(2):22-31

[12] Santosham, Mathuram; Chan, Grace J.; Lee, Ann CC; Baqui, Abdullah H.; Tan Jingwen; Black, Robert E.(2013). "Risk of Early- Onset Neonatal Infection with Maternal Infection or Colonization: A Global Systemic Review and Meta Analysis". PLoS Medicine 10(8) 1001502. Doi:10.1371/journel.pmed.1001502.ISSN 1549-1676, PMC 3747995, PMID 23976885

[13] Wang ZK, Yang YS, Stefka AT, Sun G, Peng LH (April 2014). "Review article: fungal microbiota and digestive diseases". Aliment. Pharmacol. Ther. 39 (8): 751–766. In addition, GI fungal infection is reported even among those patients with normal immune status. Digestive system-related fungal infections may be induced by both commensal opportunistic fungi and exogenous pathogenic fungi. In vitro, bacterial hydrogen peroxide or organic acids can inhibit C. albicans growth and virulence In vivo, Lactobacillus sp. can inhibit the GI colonisation and infection of C. albicans In vivo, C. albicans can suppress Lactobacillus sp. regeneration in the GI tract after antibiotic therapy

[14] Inglin, Raffael C. (2015). "High-throughput screening assays for antibacterial and antifungal activities of Lactobacillus species". Journal of Microbiological Methods. 114 (July 2015): 26–29.

[15] Abbott, S. L.; Janda, J. M. (2006). "The Genus Edwardsiella". Prokaryotes 6: 72–89

[16] W.E. Giddens, JR. K.K. Keahey, G.R Carter and C.K. Whitehair " Pneumonia in Rats Due to Infection with Corynebacterium kutscheri " Path. vet. 5: 227-237 (1968)

[17] O. Lortholory, A.Buu-Hoi, J.Y. Fagon, J. Pierre, M. Slamma, L. Gutmann, and J.F Acar " Mediastinitis due to multiply resistant Cornybacterium xerosis" Clinical infectious disease 1993;16:172