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Bacterial Contamination in Tetra Pack and Street Vended Fruit Juice Samples

[1]Rabia Ehsan, [2]Amna Shafiq, [1]Sayyada Ghufrana Nadeem and [2]Shazia Tabassum Hakim
[1]Medical Mycology Research and Reference Laboratory and [2]Virology and Tissue Culture Laboratory, Department of Microbiology, Jinnah University for Women, Karachi-74600, Pakistan.

ABSTRACT

Contamination of ready-to-eat foods and beverages sold by street vendors and hawkers rendering them unacceptable for human consumption has become a global health problem. The present study was done to compare contamination in tetra pack fruit juices and street vended fruit juices. A total of 25 fruit juice samples were analyzed for presence of bacterial pathogens. Out of 25 samples, 07 were street vended fruit juices samples while 18 samples were tetra pack fruit juices. Spread plate method is used for the isolation of these bacteria. The bacterial pathogens present in juices were *Escherichia coli* (42%), *Staphylococcus* (42%), *Enterococcus* (28%), *Streptococcus* (14%), *Bacillus* (14%) & *Diptheroids* (14%). Only one sample of tetra pack fruit juice was contaminated and the organism identified was *Bacillus*. It was found that street vended fruit juices were highly contaminated as compare to tetra pack fruit juices. The contamination is mainly due to poor quality of water used as well as unhygienic conditions related to washing of utensils. However, health education of the fruit juice vendors and implementation of standard hygienic practices should be enhanced to reduce contamination of fruit juices.

Key words: Contamination, Tetra pack, Street vendors, Bacteria, Fruit juice

INTRODUCTION

Fruit juices are well recognized for their nutritive value, mineral and vitamin content. In many tropical countries they are common man's beverages and are sold at all public places and roadside shops. However in view of their ready consumption, quick methods of cleaning, handling and extraction they could often prove to be a public health threat. There are reports of food borne illness associated with the consumption of fruit juices at several places in India and elsewhere (Parish, 1997; Sandeep, et al. 2001). Improper washing of fruits will add these bacteria to the extracts leading to contamination. In addition, use of unhygienic water for dilution, dressing with ice, prolonged preservation without refrigeration, unhygienic surroundings often with swarming houseflies and fruit flies and airborne dust can also act as sources of contamination. Such juices have shown to be potential sources of bacterial pathogens notably *Escherichia coli* O157:H7, species of *Salmonella*, *Shigella* and *Staphylococcus aureus* (Splittstosser, 1979; Harrigan, 1998; Buchanana, et al.1999). Practices used during their preparation, handling, cleaning, sorting and grading, packaging, storing and wrapping in low grade plastics are some of the factors that increase the risk of acquiring microbes (Ryu and Beuchat, 1998). The health risk of such products in particular is dependent about food safety and hygiene among vendors is also resulting in food contamination (Uljas and Ingham, 1998). Contamination of fruit juices may be due to the injured or spoiled fruits used for making juice or improper sanitary conditions maintained by the vendors during the entire process of cutting to serving. The coliforms, and *Bacillus cereus* and *Staphylococcus aureus* growth may be due to improper handling or may be due to use of contaminated water for processing. Moreover, punctures, cuts and splits

Corresponding author. E-mail: shaz2971@yahoo.com

are a potential source of entry of pathogens into fruits and vegetables. These insults can occur during growing or harvesting, while processing and improper handling also contributes to the entry of bacterial pathogens into the product, especially in juices prepared from these fruits (Sandeep, et al. 2001).

A sugarcane juice is a popular refreshing drink in many parts of Asian countries. It is extracted by crushing the sugarcane between rollers drums and served with or without ice. Hygienic standard are usually not maintained during the transport of sugarcane from the field of point of extraction and preparation of juice. Further the juice is consumed unpasteurized therefore it is possible that the sugarcane juice may be contaminated and pose health hazards. It is found to be contaminated with different bacteria e.g., *Escherichia coli, Klebisella pneumonia, Staphylococcus aureus, Enterobacter spp, citrobacter spp, Pseudomans, Enterococcus faecalis, Acinetobacter spp and Bacillus* (Lewis, et al. 2006).

Though, fruit juices are stored at low temperature to retain their wholesome fruity character for long period of time such as the grape juice at 22 to280 F (-5.5 to 2.2C) in the bulk storage, the quality of product may naturally unchanged for a period of 1 year or more however yeast contamination of grape juice is often observed (Wolford and Berry, 1948). The ability of different pathogens to survive in low pH environments has also been documented at length (Pederson, et al. 1959; Lin, et al. 1995; Gahan, et al.1996; Eribo and Ashenafi, 2003; Subannayya, et al. 2007). Therefore, it is not surprising that unpasteurized juices, such as orange and apple juices, have been identi?ed as the vehicle of food borne pathogens in several outbreaks (Parish, 1997). In particular, unpasteurized orange juice has been linked to several outbreaks of disease caused by *Salmonella sp.* (CDC, 1999; Zaika, 2001; Teeteh and Beuchat, 2003), *Shigella sp.* (Cook, et al.1998), or viruses (Fleet, et al. 2000; Krause, et al.2001) in different countries. Although foodborne pathogens can be destroyed by pasteurization, consumption of unpasteurized juice occurs frequently due to consumer preferences. Freshly squeezed juice may be an important source of pathogens if the fruit is contaminated (Thurston, et al.1998). High hydrostatic pressure can be used to inactivate microorganisms and quality-deteriorating enzymes in foods (Martý´Nez-Gonzales, et al. 2003), and, at least in some foods, like fruit juices, this process allows a better retention of the original ?avour and taste than does thermal treatment (Hoover, 1993; Knorr, 1993). Besides good retention of ?avour, an important reason for using this process is that the low pH of fruit products (pH 3 to 4) does not support growth of pathogenic bacteria which may eventually survive pressurization (Ogawa, et al. 1990). This was particularly well documented for *Escherichia coli* O157:H7 after this organism was implicated in a number of recent infectious outbreaks caused by consumption of unpasteurized apple juice and cider (Besser, et al. 1993; Weagant, et al. 1994; Leyer, et al. 1995). Clearly, the ef?cient inactivation of *Escherichia coli* will be a primary and nonnegotiable requirement for HP processes for the production of high-quality and safe fruit juices (Ogawa, et al. 1990). A combination of bacterial and yeast biocontrol strains may also be effective against pathogenic bacteria (Laio, 1999). Reported mechanisms for microorganisms that control food-borne pathogens include the reduction of the pH (Laio, 2001), as in the application of lactic acid bacteria or the competition for nutrients and/or space (Brashears and Durre; 1999; Geisen; 1999; Spadaro, et al. 2004). Lactic acid bacteria also

produce bacteriocins (Ganzle, et al. 1999; Spadaro, et al. 2002) and they may act as biocontrol agents (Laukova, et al. 2000). The main objective of this comparative study is to assess bacterial contamination in tetra pack fruit juices and street vended fruit juices.

MATERIALS AND METHODS

Sample collection:

25 samples were collected from different places of Karachi city out of which 07 are street vended fruit juices and 18 are tetra pack fruit juice.

Sample analysis:

For the analysis 25 ml of the sample diluted as 1:10 with 250 ml distilled water and filtered if any solid particle present. 100ul filtrate was used for inoculation.

Bacterial enumeration:

Isolation and enumeration was made by using different media like Nutrient agar, MacConkey's agar, Mannitol salt agar, EMB agar, Xylose lysine deoxycholate agar, and Blood agar. The inoculation was done by using spread plate method.

Spread plate method:

The spread plate method consists of evenly spreading the diluted sample over an agar plate.Ê When using this method, a volume of 0.1 ml of the diluted sample should not be used since the agar will not be able to absorb the excess.Ê Using this method yields colonies that form on the surface of the agar.

RESULTS AND DISCUSSIONS

Street vended fruit juices are well appreciated by the consumers because of their taste, low price, and availability at right time (Ohiokpehai, 2003). In spite of the potential benefits offered by fruit juices, concerns over their safety and quality have been raised; as freshly prepared juices have no process or steps to minimize the microorganisms if they are contaminated (Mahale et al. 2008). In the present study a total of 25 juice samples were analyzed for the presence of bacterial pathogens. Microbiological analysis of fruit juice samples was carried out and morphological as well as biochemical characterization of isolated organisms was done. Heavy microbial growth was seen in street vended fruit juices while only one sample of tetra pack fruit juice shows the growth of Bacillus and no growth observed in rest of the tetra pack fruit juice samples. The dominant bacterial pathogen present in street vended fruit juices were *Escherichia coli* (42%), and *Staphylococcus* (42%) (Figure). A study carried out in India also reported similar results and the food borne illness associated with the consumption of road side freshly squeezed fruit juices. The dominant pathogen accounted in their study was also *Escherichia coli* (40%). While 4% samples found to be contaminated with *Staphylococcus* in their study (Tambekar, et al. 2009). Overall the results of the present study indicate that, majority of the street vended fruit juices in many parts of the city showed contamination with bacterial pathogens.

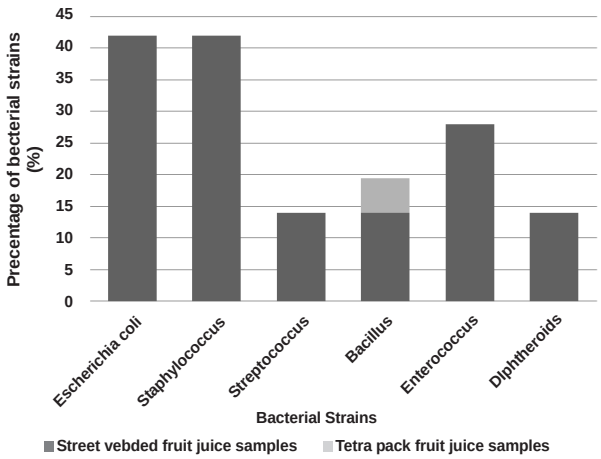

Figure: Prevalence rate of bacteria isolated from tetra pack and street vended fruit juice samples.

Faecal coliforms are often found in street vended

fruit juices it may be because the water used in preparation of juices is highly contaminated with fecal coliforms. Moreover, unhygienic physical practices of street vendors also contribute to contamination of fruit juices. The condition of street food preparation and vending rise many concern for consumers health. In most cases running water is not available at vending sites, hands and utensils washing are usually done one or more buckets and sometimes without soap, wastewater and garbage are discarded nearly, providing nutrient for insects and rodents. Some of the juices are not efficiently protected against flies, which may carry food borne pathogens safe food storage temperature are rarely applied to street vended juices in addition there are potential health risk associated with initial contamination of food by pathogenic bacteria as well as subsequent contamination by venders during preparation handling and cross contamination (Barro, et al. 2006). Escherichia coli, the most common faecal coliform is found to be associated with serious diseases in human. It causes diarrhea, urinary infections, pyogenic infections and septicemia etc (Samonis et al., 2009).

CONCLUSIONS

The present study's aim to establish the status of street vended juices and tetra pack fruit juices. Based on the undertaken study, it is concluded that street vended fruit juices are highly contaminated with bacterial pathogens as compare to tetra pack fruit juices. Therefore, tetra pack fruit juices found to be hygienic for human consumption as they are HACCP (Hazard Analysis and Critical Control Points) control. The practice of selling fruit juices by street vendors cannot be prohibited as such activities provide them with a source of livelihood but government & the health agencies must adopt measure to educate the vendors about food safety and hygienic practice. The occurrence of pathogenic micro organisms is alarming enough for an immediate action by the suitable agency. Monitoring of the quality of fruit juices on regular basis should be done to avoid bacterial pathogen outbreaks in future.

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