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Microbial Examination of Bottled Mineral Water Available in the Market

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Abstract: Microbial examination of bottled mineral water available in the market under different brand names, was carried out in order to determine total viable count, spore former, coliforms and presence or absence of mould and yeast. Results obtained showed quite variation in total viable count and spore former. The total viable count ranged from 3-23/ml and the spore former ranged from 0-25/ml. Fecal and non fecal coliforms along with moulds and yeast were absent in all the samples collected from the market.

Key words: Mineral water, microbial examination

Introduction

Water is basic requirement for all living things. The unit of all living organisms is cell and 70% of the protoplast of cell constitute water. Water acts as a medium for most of the reactions taking place in the body. Water is the potential source of microbial contamination. Many workers have reported the contamination present in water (Told, 1987; Gibbs *et al*., 1990; Yates and Yates, 1987; Marylnn, 1997; Teslya *et al*., 1996). Most water contain large number of bacteria. The number may vary depending upon the source of water. Fewer bacteria occur in sea water than in soil water (Satle, 1999). Plumbo *et al*. (1987) studied the relationship between pH and the abundance and activity of bacteria in water. The bacterial production or abundance was higher at higher pH and lower at lower pH. The normal flora of water includes *Escherichia*, *Acinetobacter*, *Acromonas*, *Bacillus*, *Corynobacterium*, *Micrococcus*, *Cytophage*, *Streptococcus*, *Pseudomonas* and *Moranella*. Suishitsu and Kenkyu (1996) studied drinking water and he found that drinking water was contaminated by microbs. Evison (1988) found that in the presence of light, the survival of bacteria in fresh water was better. Van der Kooij (1988) studied the prevention of bacterial after growth in drinking water distribution system and they proposed certain factors which affects after growth. The realisation that natural water which is pumped directly from soil and distributed to house hold without treatment has led to an increased use of bottled drinking water. However, the cleanliness of this water particularly from view point of microbial pathogens has generally not been as certained. The bottled water may contain micro organisms hazardous to human health. The present study describes the microbial examination of mineral water available in the market under different names.

Materials and Methods

Sampling: Bottled mineral water labelled with different brand names such as Alpine, Sadaf, Aqua, Nasco, Sabeel, Fine, Evien, Hayat, Cool, Zam Zam available in market and tap water samples were collected. Dilution of the samples were prepared upto 10^{-6}. As no colony was obtained at higher dilution range so one ml of sample was directly taken.

Total Viable Count: Nutrient agar medium consisting of g/l: Peptone, 6.0: Casein (hydrolyzed), 4.0: Yeast extract, 3.0: Glucose, 2.0: Beef extract, 1.50: Agar, 15.0 was used for total viable count. All the culture media, unless otherwise stated, were sterilized at 121°C (15 lbs pressure) for 15 minutes. The medium was poured in petriplates and these petriplates after inoculation were placed at 30°C in an incubator. Total colonies were counted with colony counter.

Thermophilic sporeformers: Nutrient agar medium was also used for both aerobic and anaerobic sporeformers i.e. sample suspended in saline water were given heat shock at 90°C in water bath for 10 minutes before adding to the agar plates. The plates were incubated at 37°C for 24 hours. For anaerobic sporeformers, however, sterile agar medium was poured on the incubated plates.

Yeast and Moulds: Malt extract agar medium consisting of g/L: Malt extract, 20.0: Agar, 20.0 was used for the determination of yeast and mould. The plates were then incubated at 30°C for 24 ff 48 hours.

Coliforms: The coliforms were determined by standard multiple tube fermentation technique containing Lactose broth consisting of meat extract, 39; Peptone, 10g; Lactose, 5g; Bromothymol blue indicator, 1ml and distilled water 1000 ml. The most probable number of the coliform was computed according to the formula of Jacob and Gerstein (1964).

Gram's Staining: Gram staining was done according to the method of Hucker and Conn, 1923.

Results

Total Viable Count: The data of Table 1 shows that total viable count ranged from 3-23/ml in different bottled mineral water with different brand names. Maximum contamination was found in the sample labelled with name Alpine i.e., 17-23/ml and minimum contamination was found in the sample labelled with name Evein i.e. 5-8/ml. The colour of the bacterial colony was white and off white where as some colonies were found to be of pale yellow colour. Both spiral and rod shaped bacteria were found. Gram positive and gram negative both types of bacteria were present in the samples. The sample of the water taken from the tap directly was more contaminated as compared to bottled mineral water. Total viable count in tap water ranged from 20-29/ml.

Spore Former: Many bacteria have the ability to form endospores. They are highly resistant to heat and chemicals. They are determined by giving heat shocks. The data of the Table 1 shows that spore formers were ranged from 0-25/ml. The anaerobic spore formers were present in some sample but absent in most. They ranged from 0-21/ml. Maximum aerobic spore formers are present in Alpine i.e., 12-25/ml whereas both aerobic and anaerobic both are absent in sample named as Zam Zam.

Table 1: Microbial examination of bottled mineral water

Sample		Characteristics of Predominat Colony				Spore Former/gm					Coliform	
Name	No.	Colour of colony	Garm Stanining	Morphology	Total viable count/ml	Aerobic	Anaerobic	Mold	Yeast	Fecal	Non fecal
	1	White	+	Coccus	23	22	2	-	-	-	-
Alpine	2	White	+	Bacillus	17	12	2	-	-	-	-
	3	White	+	Coccus Bacillus	22	25	14	-	-	-	-
	1	Off white	+	Coccus	15	11	2	-	-	-	-
Sadaf	2	Off white	+	Coccus	13	4	21	-	-	-	-
	3	Pale-yellow	+	Coccus	15	5	0	-	-	-	-
	1	White	+	Coccus	10	4	-	-	-	-	-
Aqua	2	White	+	Coccus	8	9	-	-	-	-	-
	3	White	+	Coccus	12	5	-	-	-	-	-
	1	White	+	Cocci Spiral	8	5	2	-	-	-	-
Nasco	2	White	+	Cocci Spiral	13	3	2	-	-	-	-
	3	White	+	Cocci Spiral	15	2	3	-	-	-	-
	1	Pale Yellow	+	Cocci	5	1	0	-	-	-	-
Sabeel	2	Pale Yellow	+	Cocci	8	2	0	-	-	-	-
	3	Pale Yellow	+	Cocci	11	1	0	-	-	-	-
	1	White	+	Cocci	12	0	0	-	-	-	-
Fine	2	White	+	Cocci	11	1	0	-	-	-	-
	3	White	+	Cocci	13	0	1	-	-	-	-
	1	Off white	-	Bacillus	6	3	1	-	-	-	-
Evien	2	Off white	-	Bacillus	8	2	2	-	-	-	-
	3	Off white	+	Bicillus	5	3	1	-	-	-	-
	1	White	+,-	Coccus Bacillus	18	7	2	-	-	-	-
Hayat	2	White	+,-	Coccus Bacillus	10	5	15	-	-	-	-
	3	White	+,-	Coccus Bacillus	12	3	3	-	-	-	-
	1	Off white	+	Coccus	12	-	-	-	-	-	-
Zam Zam	2	Off white	+	Coccus	15	-	-	-	-	-	-
	3	Off white	+	Coccus	20	-	-	-	-	-	-
	1	White	+	Coccus	13	8	3	-	-	-	-
Cool	2	White	+	Coccus	8	7	4	-	-	-	-
	3	Off white	+	Coccus	15	10	5	-	-	-	-
	1	Off white	+	Coccus	20	15	7	-	-	-	-
Tap water	2	Off white	+	Coccus	29	16	8	-	-	-	-

Yeast and Moulds: All the samples of bottled mineral water investigated showed the absence of mould and yeast. Also the mould and yeast was absent in tap water.

Coliforms: Fecal coliforms were absent in the mineral water available in the market and in tap water. Non Fecal coliforms were also absent in these samples but present in the tap water.

Discussion

The present study describes the microbial examination of bottled mineral water available in market under different names such as Alpine, Sadaf, Aqua, Nasco, Sabeel, Fine, Evien, Hayat, Cool and Zam Zam and also the examination of tap water. Samples of bottled mineral water taken from different bottling companies were found to be fairly clean and can be relied upon. Even the tap water included in the studies did not reveal major contaminations. The study is in accordance with the findings of Satle (1999) and Van der Kooij (1988). The coliform bacteria were non existing and hence the water was quite safe for drinking. It may, therefore, be unnecessary to use costly bottled water, nevertheless a regular microbiological examination of the drinking water supplied to the household may be essential to avoid any health risks. Heavy bacterial contamination in bottled mineral water as compared to fungal contamination. It is recommended, however, the bottled water may be preferred during travelling when the quality of drinking water available on the road side can not be as relied. In net shell it was pleasant to know that the bottle water was free of serious contamination and the claims of the suppliers generally hold true regarding to water quality.

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