IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

BACTERIOLOGICAL ANALYSIS OF WATER QUALITY IN DIFFERENT AREAS OF INDORE CITY

Neha Panwar
Institute of Biological Science
SAGE University, Indore, India.

Abstract: Water is one of the most important substances on earth. The importance of water in our diet is apparent as it helps the body to perform specific metabolic tasks and regulates our body temperature; moreover, water is unique as its density is similar to that of cell protoplasm. There is no doubt that water is everywhere and it is very important to our Earth and the life inhabiting it. Water also acts as the vector for many diseases caused by bacteria, viruses, protozoa and worms. For water to be regarded as potable, it must be free from pathogens. It must not contain any other noxious substances such as chemical hazards including pesticides, insecticides or herbicides, artificial fertilizers or heavy metal ions. It should not have any unpleasant odor or taste. The diseases spreading through contaminated water are known as waterborne diseases. More than 2 million people die each year from diseases such as Cholera, Typhoid, and Dysentery that are spread by contaminated water or by a lack of water for hygiene. Waterborne pathogens are a leading cause of disease and death worldwide. Routine microbiological testing of drinking water supplies, recreational waters and environmental waters is essential for the protection of public health. The main work done under this experiment of microbial analysis was to detect different bacteria and fungi. Water samples from four different regions were collected and analyses. The four different regions were: Region I- Shrinagar extension and Region II-Marimata in Indore area. Hence, it is worth mentioning here that the water of Region III is more potable as compared to that of other region in terms of microbes present in it.

Keywords: Drinking water sample, *E.coli, Pseudomonas, Salmonella, Staphylococcus aureus*

INTRODUCTION

India is rich in water resources, being endowed with a network of rivers and blessed with snow cover in the Himalayan range that can meet a variety of water requirements of the country (Bhardwaj, 2005). The rivers of India play an important role in the lives of the Indian people. Water resources are great significance for various activities such as drinking, irrigation, aqua culture and power generation. The importance of sustained hydrological studies on Indian waters is now recognized in water resource management due to exploitation of fresh water resources. Report of the scientists at All India Institute of Medical Sciences (AIIMS), New Delhi, finds an alarming prevalence of various diseases causing microbes in drinking water and recreational water. The use of this water may lead to several life-threatening diseases. Different authors also reported that Indian River system is polluted mainly because of the human impact (Goel and Bhosale, 2001; Patil et al., 2003; Maity et al., 2004). Significance of water as a potent ecological factor can be appreciated only by studying its physico-chemical and microbial characteristics. Major factors affecting microbiological quality of surface waters are discharges from sewage works and runoff from informal settlements. Indicator organisms are commonly used to assess the microbiological quality of surface waters and faecal coliforms (FC) are the most commonly used bacterial indicator of faecal pollution (South Africa, 1998). They are found in water that is contaminated with faecal wastes of human and animal origin. Total coliforms (TC) comprise bacterial species of faecal origin as well as other bacterial groups (e.g. bacteria commonly occurring in soil). The coliforms are indicative of the general hygienic quality of the water and potential risk of infectious diseases from water. High FC and TC counts in water are usually manifested in the form of diarrhoea and sometimes by fever and other secondary complications. Bathing and swimming in streams and river are also common among children and adults in the local community. The probability of ingesting infective dose of disease causing microorganism is very high considering the fact that water borne pathogens generally have low infective dose.

MATERIAL AND METHOD

All the chemicals and culture media for microbial analysis were purchased from SRL chemicals Ltd Mumbai,

Sample Collection Preparation-

Water samples from different sources *viz* Ground, RO, Municipal and Well were obtained freshly from four different regions in Shrinagar extension and Marimata of Indore city Madhya Pradesh.

Method

There are two parts of microbial analysis of water samples-

Membrane filtration technique-

A typical MF method for water analysis is performed by passing a known volume of water through a sterile membrane filter (nitrocellulose membrane in our case) with a pore size small enough to retain bacterial and fungal cells (typically 0.45µm). The filter membrane was then cut into half and transferred into two mediums: **Lysogeny Broth (LB)** for the growth of bacteria & **SD medium** for the growth of fungi. (APHA, 1992; Anonymous, 1982).

LB medium and SD medium was prepared in a conical flask, and then it was autoclaved for complete sterilization. After cooling the broth, it was poured (5 ml) into 16 sterilized test tubes. Then 0.1 ml of different water samples of four different regions was inoculated into these test tubes. After 24 hours of incubation, it has been observed that test tubes containing different water samples of four different regions showed the growth of bacteria in the form of turbidity. The extent of turbidity was of varying amount in different water samples.

Microbial Limit test-

Microbial Limit Test includes the detection of presence/absence of specific microorganisms (i.e., bacteria and fungi in our case). Microbial limit test must be carried out under conditions to design to avoid accidental microbial contamination of the preparation during the test. When test pathogens have antimicrobial activity, or certain antimicrobial substances, any such antimicrobial properties must be eliminated by means of procedures such as dilution, filtration, neutralization or inactivation.
Mainly these four bacteria were taken into account under this experiment:
E.coli, Pseudomonas, Salmonella and *Staphylococcus aureus*
Following media were prepared for the detection of specific microorganisms:
Cetrimide Agar for *Pseudomonas*, MacConkey Agar for *E.coli,* Xylose Lysine Deoxycholate (XLD) Agar for *Salmonella and* Mannitol Salt Agar for *Staphylococcus aureus.*
Inoculating loop, streak a portion from enrichment culture (obtained from LB medium of previous test) on the surface of MacConkey agar plate, Xylose Lysine Deoxycholate (XLD) Agar, Mannitol Salt Agar and Cetrimide Agar plate. Simultaneously carry out the positive control by streaking a growth of *E.coli, Pseudomonas, Salmonella* and *Staphylococcus aureus* on the surface of different agar plate. For negative control incubate the plates as it is without inoculation. Invert and incubate all the plates at 35 to 37°c for 24 hours. Next day examine the bacterial colonies on the agar plates.

RESULTS AND DISCUSSION

High microbial counts in water are undesirable because of the increased likelihood that pathogens may be present, the possibility that these organisms will find access to foods and drink thereby causing spoilage and the adverse effects such organisms may have on pipelines and processing equipment. Biofilms may clog pipes and tubes and they are resistant to biocides and antibiotics which may cause food poisoning. Generally, the chemical quality of the water samples under study falls within the standards stipulated by World Health Organization and Federal Environmental Protection Agency. (FEPA) standards (WHO 1984; 1989; APHA, 1992). High level of microbial contamination of water supply within LASU campus could be due to faculty distribution network as well as much body contact with the water. Waste disposal facilities into bore holes might be responsible. High coliform counts were the most common reason for the failure of potable water to meet acceptable standards (Le Chevallier et al 1996). Although, it may sometimes be necessary to seek specific pathogens in water in response to epidemiological investigation following outbreaks of water-borne diseases of biofilms formation, the microbiological quality of drinking water has attracted great attention worldwide because of implied public health impacts (Amira, 2011). Total and fecal coliform have been used extensively for many years as indicators for determining the sanitary quality of water sources. Water born outbreaks are the most obvious manifestation of waterborne disease.

Four water samples were collected from the study area, two samples from two different regions. On the basis of different water samples of two different regions, it can be concluded that water samples of Shrinagar extension and Marimata did not show any growth on cetrimide agar. Also, minimum growth of *E.coli* was observed in water samples of Shrinagar extension. So Shrinagar extension may be regarded as safe as far as *pseudomon*as and *E.coli* are concerned. So, it may be stated that Shrinagar extension is almost free from salmonella bacteria. Water samples of region Shrinagar extension and Marimata did not show any growth in MSA. So Region Shrinagar extension and Marimata are free from staphylococcus. Hence it is worth mentioning here that the water of region Shrinagar extension and Marimata are not potable and need to be purify as compared to that of other region in terms of microbes present in it.

Water samples	Microbial Analysis Region III- Shrinagar Extension						
	Turbidity		MLT (Microbial growth)				
	LB	SDM	Cet.	Mac.	XLD	MSA	SDA
Ro	++	+	Nil	+	++++	Nil	+++
Municipal	+	++	Nil	++++	+	Nil	++

Water samples	Microbial Analysis Region IV- Marimata						
	Turbidity		MLT (Microbial growth)				
	LB	SDM	Cet.	Mac.	XLD	MSA	SDA
Ro	+++	++++	Nil	+	+	Nil	++
Municipal	+	+	Nil	++++	++	Nil	+

Remark: - + denote the growth of bacterial colonies and turbidity.

CONCLUSION

In conclusion, the majority of water samples of different region had unacceptable for drinking purpose. Presence of *E. coli* indicates that drinking water is fecally polluted. Water and other pollutant contaminate the drinking water and alter their quality. Due to poor water quality the resident of Indore city is exposed to health problem linked with drinking water and outbreaks of the waterborne diseases are common in Indore city.

REFERENCES

[1] [No authors listed] (1987) Overall evaluations of carcinogenicity: an updating of IARC Monographs volumes 1 to 42. IARC Monogr Eval Carcinog Risks Hum Suppl 7: 1-440.

[2] American Water works Association (AWA) (1991) Health effect of disinfectants and disinfection by products. Denver Co., New York, pp: 86-98.

[3] Amira AA, Yassir ME (2011). Bacteriological qualityof drinking water in Nyala, South Darfur, Sudan. Environ. Monit. Assess,175: 37–43

[4] APHA (1992) Microbiological Examination of Water In: Standard methods evaluation of water one wastewater 18th ed. American Public Health Association, Washington, D.C.

[5] BHARDWAJ, R. M. Water quality monitoring in India – achievements and constraints. In: INTERNATIONAL WORK SESSION ON WATER STATISTICS, Vienna, June 20- 22, 2005, Vienna. Available in: Access in: 16 Ag. 2012.

[6] Chapman, D. 1992. Water quality assessment. London, Chapman and Hall (on behalf of UNESCO, WHO and UNEP). Pp. 585.

[7] Chapman, D. and Kimstach, V. 1992. Selection of water quality variables. In: Water assessment. (Ed.) Chapman, D. UNESCO, WHO and UNEP. 59-126.

[8] Debels, P., Figueroa, R., Urrutla, R. Barra, R. and Niell, X. 2005. Evaluation of water quality in the Chillian River (Central Chile) using physicochemical parameters and modified water quality index. Environmental Monitoring and Assessment, 110: 301-322.

[9] Degremont J (1991) Water treatment handbook. Lavoisier, Paris, pp:10-15.

[10] Department of the Environment, Welsh Office (DEWO) (1989) Guidance and safeguarding the quality of public water suppliers. Her Majesty's Stationery Office London.

[11] Dugan, R. 1972. Biochemical ecology of water pollution. Plenum Publishing Co. Ltd. New York.

[12] GOEL, P. K.; BHOSALE, P. M. Studies on the river Panchganga at Kolhapur with special reference to human impact on water quality. In: TRIPATHY, G.; PANDEY, G. C. (Eds.). Current topics in environmental sciences. [S.l.]: ABD Publishers, 2001. p. 108-122.

[13] Havelaar A, Blumenthal UJ, Strauss M, Kay D, Bartram J (2001) Guidelines: the current position. Water quality: Guidelines, Standards and Health.pp: 17-42.

[14] Le Chevallier, M.N. Welch and D. Smith (1996) Full-scale studies of factors related to coliform regrowth in drinking water. Appl. Environ. Microbiol.62:2201-2211.

[15] Mishra, B.P. 1992. Ecological studies on pollution and management of river Ganga in Varanasi. Ph.D. Thesis, Banaras Hindu University, Varanasi.

[16] Mishra, B.P. and Tripathi, B.D. 2000. Sewage quality analysis: pollutants removal efficiency of a sewage treatment plant. Journal of Industrial Pollution Control. 16(2): 239-251.

[17] Rotimi, J. and Iloba, B.N. 2003. Assessing the water condition of two surface waters in Southern Nigeria: The role of aquatic insects as bioindicators. Poll. Res. 29(2): 165- 169

[18] Saleh MA, Emmanuel E, Joseph J, Wilson BL (2001) Chemical evaluation of commercial bottled drinking water from Egypt. Journal of Food composition and Analysis 127-152.

[19] SOUTH AFRICA. Department of Water Affairs and Forestry. Water Research Commission. Quality of domestic water supplies: volume 1: assessment guide. 2. ed. Pretoria, 1998.

[20] WHO (1989) Water Quality Regulations In: Guidelines for drinking water quality World Health Organization, Geneva Switzerland.

[21] WHO (2004) Guidelines for Drinking-water Quality. Geneva: World Health Organization.