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Microbial Flora of Perumchani Reservoir of Kanniyakumari District of Tamil Nadu

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ABSTRACT

Microbial investigation of Perumchani reservoir was undertaken to find out the impact of humans on this precious water resource. Microbiological analysis showed the presence of *Total coliforms, Faecal coliforms* and *Streptococcus faecalis*. The level of bacterial contamination which has been observed in this reservoir water under investigation supporting the fact that the water of the reservoir is being polluted in nature. The results also revealed that the situation is alarming. A massive bacterial gene pool was obtained after this study was indicative of immense bacterial diversity in the region. The Faecal coliform vounts exceeding acceptable limits are pinpointing of pollution from domestic wastes from several settlements located around the reservoir. Water uses in the area were determined and were found to be mainly agriculture and domestic. The gross pollution of the reservoir exposes the local people who depend on it for their primary water source to serious health risk.

Key Words : Microbial flora, *Total coliforms, Faecal coliforms* and *Streptococcus faecalis*.

INTRODUCTION

Water is the most precious of all natural resources and the greatest gift of God. The history of human civilization reveals that water supply and civilization are synonyms. According to the evolutionary scientists, it is believed that life on earth began in the seas. Natural water contains many suspended and dissolved solids, sand, micro organism etc. The quality of fresh water is very critical in sustaining ability of the ecosystem. High quality drinking water is of vital importance to human life and the source of water is varied. The pollution of water not only alters the biotic and abiotic

factors but also paralyze the general fabric of human health and hygiene (Kumar, 2003). . Widespread pollution of surface and groundwater is reducing the quality of fresh water resources. India has about 975 reservoirs covering an area of 1.70 million hectares (Srivastava, 2002). The impact of humans on water bodies is so immense that millions do not have adequate quantities of safe drinking water particularly during the summer months (Pandey, 2003). The coliform index is an evaluation of the purity of water based on a count of faecal bacteria. It is one of much analysis done to assure adequate water quality. This test can determine if the water has possibly been exposed to fecal contamination (Lewis, and Chattopadyay, 1986). That is, whether it has come in contact with human or animal feces. It is significant to be familiar with this because many pathogenic micro organisms are shifted from human and animal feces to water, from where they can be ingested by people and infect them.

Study Area

The study area is located in the south west region of the Western Ghats in Peninsular India. The south Western Ghats is a chain of mountains running parallel to India's western coast about 30-60 kms inland. The mountain range cover an area of about 160,000 km^2 and stretch for 1600 kms from Gujarat in the northern region to southern tip of Tamil Nadu (Kanyakumari) in the southern region. The Perumchani reservoir area belongs to the State of Tamil Nadu and is located at $89^0 22^1$ latitude and $77^0 22^1$ East longitude and falls in Kalkulam Taluk of Surulacode village in Kanya Kumari district. The water comes from Kodayar basin. It is built across Paraliyar river. The dam was constructed to supplement, as water for the Kodayar lake when it was found inadequate for irrigation.

Sampling of water

Sampling of water was done during April 2016- March 2017. High grade thoroughly cleaned plastic bottles of 2- liter capacity was used. Before filling they were rinsed and sterilized with hot water and then samples are takened. Monthly collections were done.

Analysis of water

Microbial analysis of the water samples were done using the method Microbiological Analysis of Drinking Water Quality: Water samples were collected in

accordance with the standard methods for the examination of water and wastewater (APHA, 2005). 500 ml of water sample was collected from each study station in sterile capped containers from the Perumchani reservoir in all seasons from June/July, 2016 to April/May 2017 Samples were collected in 500 ml sterile glass bottles. They were kept in air tight ice boxes and transported within the 6 hours their collection for bacteriological examination. Enumeration, isolation and characterization of micro organisms were done according to the methods described by Williams (1989) and Aneja (2004) to determine the degree of contamination. Total coliforms, *Faecal coliforms*, and *Faecal streptococci* were counted. Total coliforms, fecal coliforms, and fecal streptococci were counted using Most Probable Number (MPN) method. analysis like the number of bacterial colonies, number of total coliform, *Faecal coliform* and *Faecal streptococci* were measured by standard plate count (SPC), most probable number (MPN), *Faecal coliform* count (FCC) and Faecal streptococcal count (FSC) respectively. All the collected water samples were analysed within 24 hr. The numbers of bacterial colonies were counted by colony counter. All estimations were carried out using five replicates. The data presented are mean of five independent determinations. MPN test protocol. Bacteriological analysis was carried out for indicator organisms i.e. Total and Faecal coliform by most probable number (MPN) method (1, 2,). 15 tubes of MacConkey broth (Hi media, Mumbai) were arranged in three rows. First row containing 10 ml double strength MacConkey broth was inoculated with 10 ml of water sample. Second and third row containing 10 ml single strength MacConkey broth medium was inoculated with 1 ml and 0.1 ml water sample respectively. After incubation at 44° C for 24 hours coliform number was determined by the following formula. MPN/100ml = No. of + ve tubes x 100 √ (ml of water sample in all tubes) x (ml of water sample in – ve tubes) Faecal coliform was enumerated by SPC technique using Endo agar as a selective and differential medium for E. coli. Qualitative analysis. All the collected water samples were analysed within 24 hr. The numbers of bacterial colonies were counted by colony counter. All estimations were carried out using five replicates. The data is presented are mean of five replicates.

RESULTS AND DISCUSSION

Water is the most precious of all natural resources and the greatest gift of God. The history of human civilization reveals that water supply and civilization are synonyms. The *Vedas*, the *Upanishads*, the *Holy Bible* are religious as well as epic literary works which states the importance of water and its role in the sustenance of life. Water like other elements has been worshipped since ancient times. However, in this modern era water has become a "rare commodity" in its pure form.

Microbiological analysis of reservoir water revealed the presence of three different microorganisms. Total coliforms, Faecal coliforms and *Streptococcus faecalis*. Among the microorganisms, Total coliforms distribution was seen during the whole period of study. Microbiological analysis of reservoir water revealed the presence of three different microorganisms. Total coliforms, Faecal coliforms and *Streptococcus faecalis*. Among the microorganisms, Total coliforms distribution was seen during the whole period of study. Total coliforms distribution was maximum during the months after the rainy season (July to September 2018). The summer months registered lower values of Total coliforms than post rainy months. High numbers of Total coliforms were seen during August 2018. The annual average ranged from 56.2 MPN/100ml to 473.6 MPN/100ml at station 3 followed by station 4 (Fig.1).The mean concentration of total coliforms in the water samples was lowest (35.8±1.5 MPN/100 ml) at station 1. The highest concentration, (503.2±18.6 MPN/100ml) was recorded at station 3 in the rainy season followed by station 4 (466.0±1.8 MPN/100ml) (Fig 1). The mean number of Feacal coliforms also showed a similar trend like Total coliform distribution among the stations samples analysed (Fig 2). The highest number of 543.2 MPN/100 ml was observed in the sample from station 3 followed by sample from station 4 (382.4 MPN/100 ml. However the number of Faecal coliforms calculated was more compared to Total coliform count (Fig 1 & 2). Both the coliforms were in low levels at station 1 and 5.

The Total coliforms and Faecal coliforms were found to be the highest at station 3 and 4 during monsoon season and less count was observed at all stations during 2017-18 summer season (Fig 1&2). The results also clearly revealed that all the water samples in the study points and in different

seasons were contaminated with high amount of bacterial population than permissible limit and consequently the reservoir water failed to meet the WHO/BIS drinking standards (zero coliforms per 100 ml). The MPN number was very high in station 3 site indicating the water itself is contaminated with fecal coliforms from human and animal sources. The reason for high number of bacterial colonies might be due to inadequate maintenance of water reservoirs and the entry of sewage into the reservoir.

The presence of various coliform in water demand attention. The impact of humans and the unawareness of however the low levels of bacterial contamination indicate the less polluted nature of this reservoir. The drinking water standard recommended by ICMR for coliform group is 1 per 100ml of water. Hence steps have to be taken to impart awareness among the public by bringing in NGOs and student fronts together so as to conserve this priceless water body for future generations.

Fig 1 Average Mean of Most Probable Number of Total Coliforms in the Samples From Different Stations

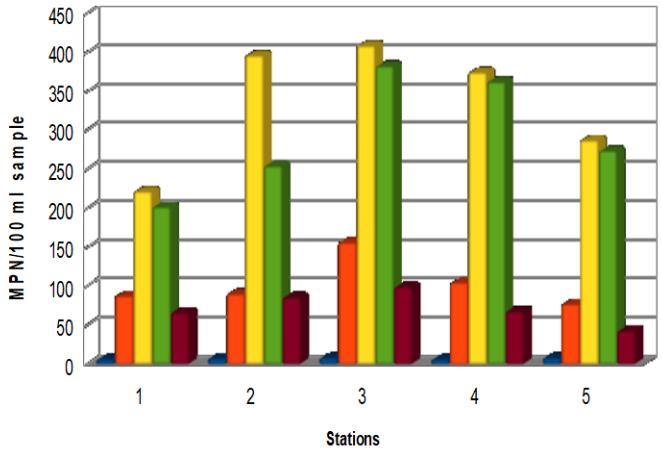
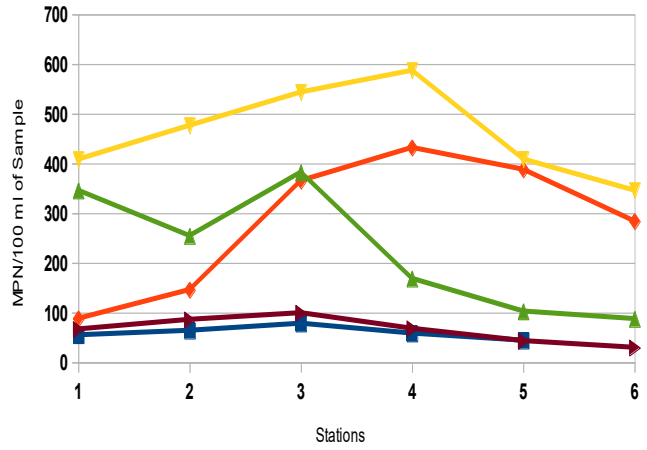


Fig 2 Average Mean of Most Probable Number of Faecal Coliforms in the samples from Different Stations



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