

Microbiological Quality Assessment of different Ghats of Ganga River water, Varanasi, UP, India.

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Abstract

Water is a potential and essential component of our daily life, and if it's not safe for drinking purpose, it is regarded as and disease causing for human consumption. Here in this course of study the microbial quality of the Ganga River at Vishwanath Corridor Varanasi, Uttar Pradesh is assessed to infer the significant amount of micro flora in it. The observational and significant technique used here is MPN (Most Probable Number). Here the study will be focusing on the amount of Total Coliform present in the Holy water Ganga and significantly discussed about the Water Quality and health implication. Since water is the basic requirement for not only humans but also for every Living Organisms, Quality and purity in view of human health specially in view it's microbial contamination.

Keywords: Water microbiology, water quality, MPN, Mac Conkey, TC (Total Coliform)

Introduction

Water is the most important natural resource which is used in our daily lives and nothing can be its substitute. The population of the world is increasing at alarming rate and the supply of freshwater is thus a major challenge for developing countries especially India (Abdelhafiz et al 2021).The point and non point sources of contamination is creating an unbalanced ecosystem (Zhang et al 2020).Water should be free from contamination to make it suitable for human consumption. Contaminated water systems increase high risks to human health (Florini et al 2020). Water borne diseases are not only impacting the mortality rate but also creating an adverse impact on the overall ecosystem and hence creating an unsustainable approach and an threat to ecosystem in general. Due to the longitudinal heterogeneity in rivers, evaluation of temporal and spatial patterns of water quality and microbial contamination is important (Singh et al 2022). Analyzing the water Quality will in general conclude whether the water from a particular source is safe for human consumption or not and if it is not then what amount of Contamination is present in it. Bacterial sources and the degree of complexity also contribute in it. (Helen et al 2016).Water quality should hence be examined to ensure safe water for agricultural uses (Giglio et al 2017).Presence of indicator microorganism increases the potential risk of damage to human population if consumed (Baghel et al 2005).The presence of coliforms in water bodies indicates contamination from organic matter due to anthropogenic activities (Fernandez et al 2022). Coliform bacteria causes serious health issues if left untreated (Seo et al 2019) .Water Borne diseases and many more criteria need to be studied, in order to assess the Quality of water.

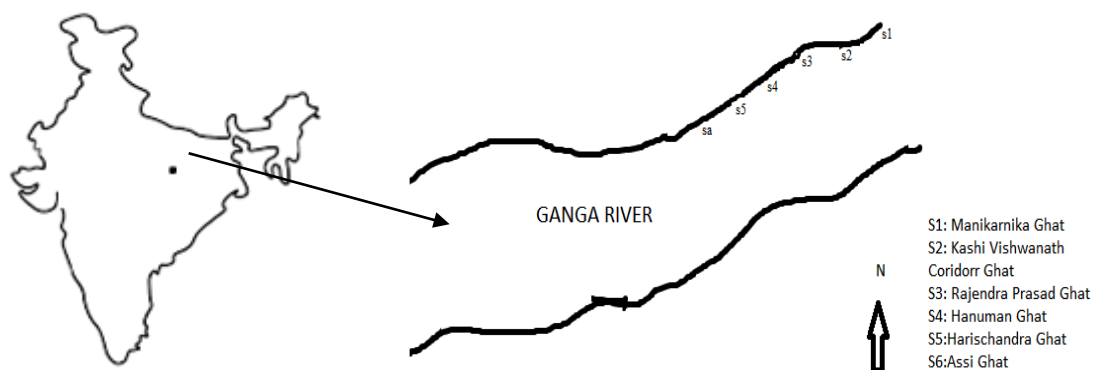


Figure (1) Study site (Ganga River, Varanasi, UP, India)

The amount of Total Coliform, and Faecal Coliform, depends on the anthropogenic activities and amount may be depend on conditions (Newell et al 2015) Total Coliform and Faecal Coliform have an important effect on the quality of water and it's index (Kothari et al 2021). This is achieved by doing most probable number (MPN test) of the water sample. The MPN test will give the amount of coliform count (Total Coliform and Faecal Coliform) present in the water sample. It is performed in three phases Presumptive, Confirmatory and final test. Total Coliform gives the amount of coliform bacteria; whose subpart is the fecal coliform under which comes *E. coli*. If the presumptive test comes out to be positive the positive test tubes are further used to proceed with the confirmatory test. The significance of MPN test is many like analyzing water quality to, creating an idea about the microflora contamination and holistic approach to create a statistical approach of the subsequent results. The sample site is Ganga River, at Vishwanath Corridor. The water quality of Ganga, the life line to hundreds of million people, has severely depleted (Dwivedi et al 2018). The Ganga River from decades is considered as Holy River due to its religious and scientific prospectus in whole world.

People from all across the globe worship river Ganga at various places, Varanasi be at the top most position. Since it has such a significant note to deal with the study on it becomes more of relevance. The methodology of the test is simple yet complicated to be understood but with subsequent techniques and procedure it is analyzed significantly. Here MPN is performed with all the three phases and the water quality is reported that whether it is suitable for domestic purpose, drinking and other uses. When it comes to river Ganga the amount of micro flora contamination increases at the time of tourist visits which remains as such in the water and bacterial population increases in tremendous amount. These all factors significantly declines the quality of water Poverty is also a major cause for the consumption of untreated water (Obioma et al 2017). Research in future should focus on knowing the sources of contamination and ways to deal with it. (Akita et al 2021).

Materials and Methods

Water Samples were collected from Manikarnika Ghat, Kashi Vishwanath Corridor Ghat (JalasenGhat), Rajendra Prasad Ghat, Hanuman Ghat, Harischandra Ghat and AssiGhat in sterile glass bottles and transferred aseptically to the Environmental Microbiology Departmental laboratory of Babasaheb Bhimrao Ambedkar University Lucknow. Samples were collected during Summer Season. The water Quality was determined by the standard Most Probable Number (MPN) method. Coliforms were detected by inoculation of Sample into tube containing MacConkey broth at 37°C for 48h. The positive tubes were subcultured into Brilliant Green Bile Lactose Broth (BGBL) and incubated at 45°C. Gas production indicates the presence of Faecal coli form after 48h of incubation. Nutrient Agar was used to calculate cfu/ml. It is determined by the formula.

$Cfu/ml = \text{Number of colonies} * \text{dilution factor}$

Volume of culture plate

Dilution factor = $1/\text{dilution}$, that is the reciprocal

Of dilution is called as Dilution factor.

Results and Discussion

The total coliform while performing the MPN test of Manikarnika Ghat, Kashi Vishwanath Corridor Ghat, Rajendra Prasad Ghat, Hanuman Ghat, Harischandra Ghat and AssiGhat following results were obtained.

After analyzing ,it can be inferred that the total coliform counts of samples were 1100/100ml, 920/100ml, 210/100ml,1600/100ml,250/100ml, and 540/100ml respectively. The positive test tubes are further undertaken for confirmatory test using Brilliant Green Bile Lactose Broth (BGBL) to confirm the presence of Faecal Coliform of samples. The turbidity infers that Faecal coliform is also present in the samples. The inoculum from the positive tubes was streaked on EMB Plate to see the presence of *E. coli*. There was no green metallic sheen on EMB plate. The colonies appeared to be dark pink in color.

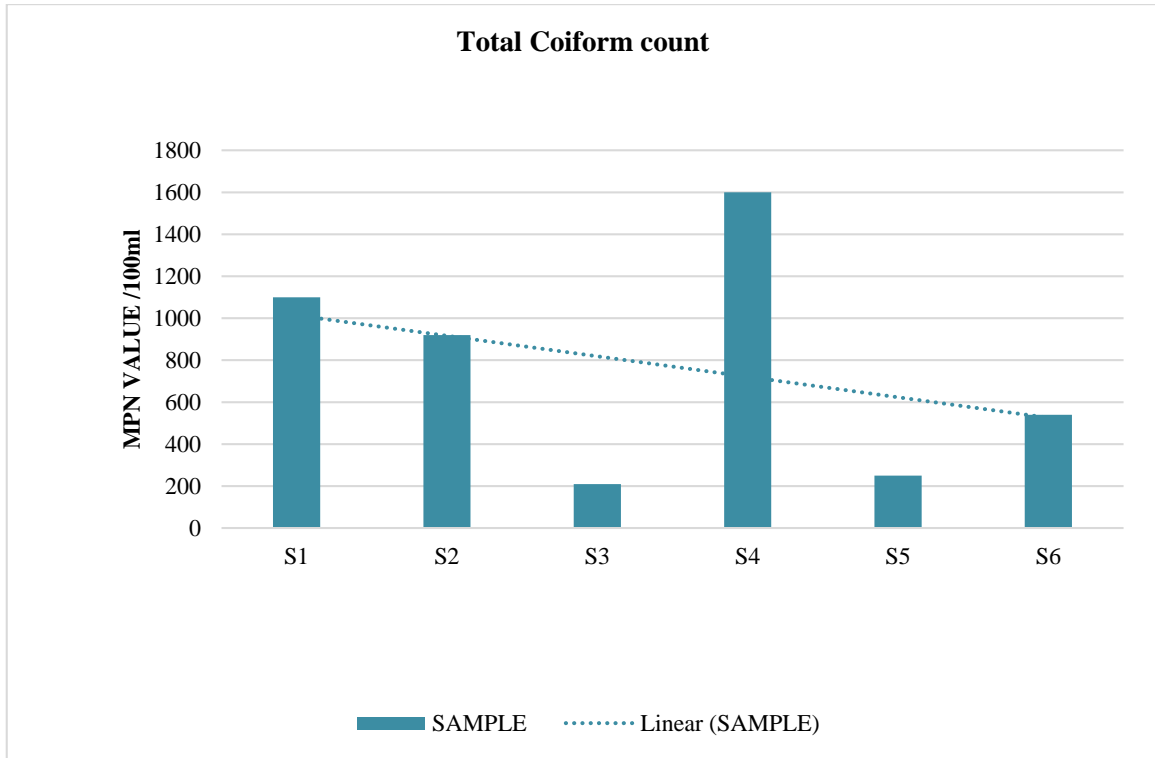


Figure (2) – Total Coliform Count of various sample sites

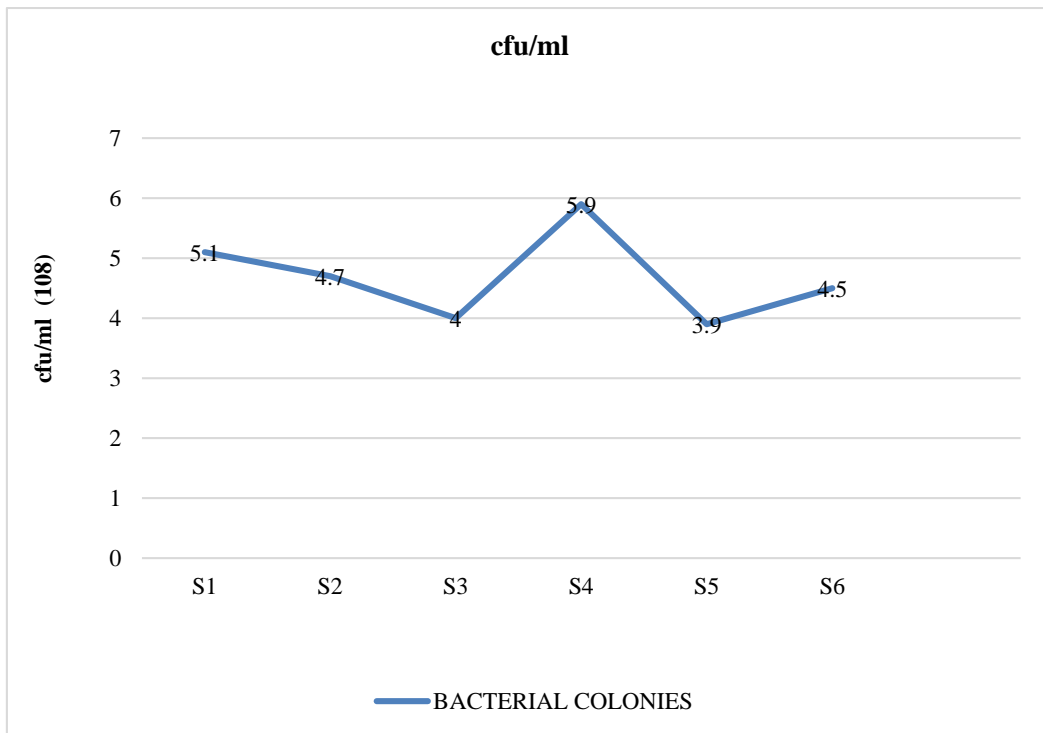


Figure (3) – cfu/ml of various samples

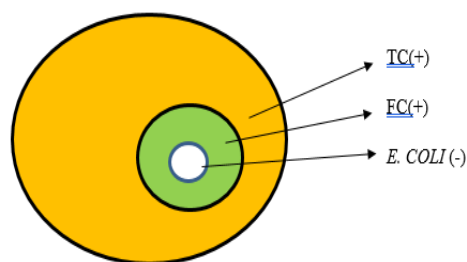


Figure (4)- Diagram indicating negative *E. coli* in samples

After Analyzation, it can be concluded that Kashi Vishwanath Corridor Ghat is significantly contaminated with Total Coliform, and Faecal Coliform, mainly because of point and Non- point source of contamination at the site. Hence, it can be said that water of the Kashi Vishwanath Corridor Ghat is contaminated with total coliform and faecal coliform which indicates that some other type of bacteria and microorganisms may be present and that has indicating in two direction on presence of this contamination and no of this contamination in directly. Proportional to human health so further studies is needed to explain the contamination and cause of contamination present at study area.

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