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Bacteriological analysis of groundwater samples in Saharsa district, Bihar

Goutam Kumar^{a*} & R.B.Jha^b

^aUniversity Department of Zoology, B.N.M. University, Madhepura, Bihar, India

^bPrincipal, R.M.College, Saharsa, Bihar, India

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Abstract:- Ground water samples in general & those drawn from different pockets of Saharsa districts need proper investigation with respect to bacteriological composition which determine the biological property of water, in addition to their investigating physicochemical profile. Samples from 30 different sites of Saharsa urban areas, collected from the ground water resource were analyzed for bacteriological population present in them by MPN test method. MPN stands for most probable number analysis is a statistical method based on the random dispersion of microorganism per volume in given sample. In the present research paper 6 different types of bacterias have been analysed.

Key words: Bacteriological, physicochemical, *E. coli*, Coliforms, tetrameric, *S. typhimurium*

INTRODUCTION

According to an important quotation of living pharmacologist 'water is elixir of life' the fortifying importance of drinking water drawn from ground water resources can be easily understood. Since liquid water, used in drinking purpose as unseen physicochemical & bacteriological properties one can't be sure to what are the bacteriological population present in the sample in time & space. All the characteristics, of water nevertheless reflect ample dynamicism because the parameters governing these characters are highly changeable. The present investigation may seem to be repetition of the previous efforts. Yet targets has been made to investigate & standarise the bacteriological properties for one tetrameric seasonal package in a year.

Since water is regarded as one of the basic component of living organism & the increasing population density

*Corresponding author :

Phone : 8340384640

E-mail : gautamrajgurukul@gmail.com

has increased its demand¹⁻⁴. Rapid industrialization, urbanization, & other activities has led the water resources get contaminated are several of reasons which resulted in the degradation of aquatic population. There are about 1.2 billion people worldwide who are not having access to safe water⁵⁻⁷. Due to above reasons water resources have become more susceptible to contaminations with various microorganisms and other pollutants⁸⁻¹⁰. Contamination of ground water usually varies depending on seasonal changes, soil, rock type etc^{11,12}. Besides the various organic & inorganic compound found in water most of these resources are also subjected to harmful aquatic organisms which may also lead to several disease and infections. Availability & supply is not only the major problem of water but its quality is the topmost reason for the utility of water. Major regions with contaminated water where the population is very high, not having the awareness about sanitations, hygiene practices, and industrial areas.

Bacteriological analysis is the method that is usually used to analyse the number of bacteria present in water &

sometimes to study about the type of bacteria. It is one of the method which is generally conducted to get information about the quality of water. It is generally the micro biological analytical procedure where sample of water is used for the bacterial study.

There are various different types of micro-organisms that are found in water resources such as Coliforms which are the group of bacteria that are usually rod in shape. *E. coli* is an example of coliforms that are considered as the major microbial indicators for monitoring the quality of water samples. Coliforms are the bacteria that are present in environment and also found in the feces of warm blooded animals. Their presence in drinking water causes several diseases. These are also found in the intestine and gut of some animals. Most of the types of *E. coli* are harmless to humans but some of their strains are also harmful when present in water causing several diseases. In contrast to coliforms several other bacteria are also found such as *salmonella*, *Legionella* etc, that causes several types of waterborne diseases which can be prove very hazardous to the livestock.

MATERIALS & METHODS

Study setting

The study for bacteriological analysis was conducted in different urban areas of Saharsa district in Bihar. The sample required was collected from 30 different water resources found in this area including the well water sample, hand pump water sample, tube well water, pond water, river water during the four different seasons from 2019-2020. The water samples were collected from different water resources during the morning hours in a clean plastic bottles & the bottle was immediately closed so that the water does not get contaminated with other

types of bacteria. The study was performed during the morning hour when the water remained still in rivers and ponds.

Determination of bacteriological analysis

For the bacteriological analysis water samples from different water resources were collected and brought in the university laboratory to observe the presence of different types of micro-organisms by using the MPN test method. MPN test is considered as one of the specific test to determine the presence of bacteria count in the given samples. MPN stands for most probable number which statistically used for the estimation the numbers of bacteria in the given sample by inoculating broth in 10-fold dilutions. This method is basically used for estimation of bacterial cells in water and food.

For the bacteriological analysis MacConkey was dissolved in 100ml of distilled water and then autoclaved at 121°C for 15 minutes and then cooled at room temperature. About 10 ml of the prepared solution was then filled in test tube in which Durham's tube was added keeping it in inverted position for the determination of fermentation gas. The whole process is followed by series of tubes. Thus the method is usually completed in given three steps:-

- Presumptive test
- Confirmed test
- Completed test

RESULT & DISCUSSION

The major purpose for the bacteriological analysis water from the different water resources of Saharsa district was to determine the presence of bacteria in the given sample of drinking water used by the people in those areas. The research done on the bacteriological analysis showed the following result.

Fig. 1- Different types of bacteria observed

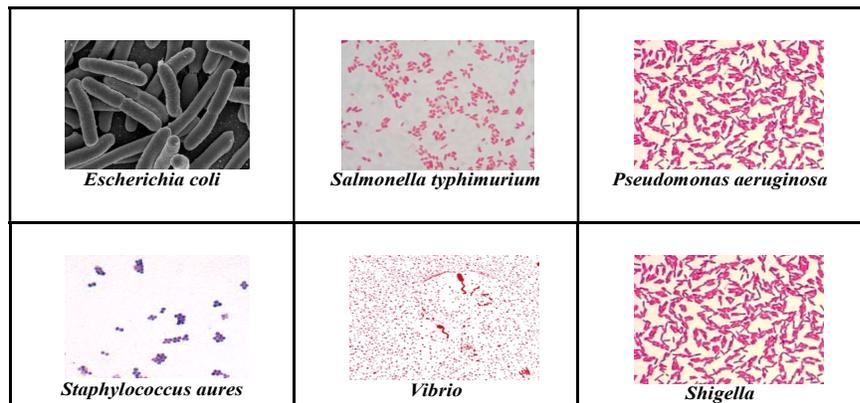


Table 1 :- Occurrence of bacteria in different seasons during the year 2019-2020

Rainy season (August- October)

Sl No	Microorganisms	Total count
1	<i>Escherichia coli</i>	25
2	<i>Salmonella typhimurium</i>	7
3	<i>Pseudomonas aeruginosa</i>	8
4	<i>Staphylococcus aureus</i>	9
5	<i>Vibrio</i>	5
6	<i>Shigella</i>	4

Winter season (January-December)

Sl. No	Microorganisms	Total count
1	<i>Escherichia coli</i>	12
2	<i>Salmonella typhimurium</i>	11
3	<i>Pseudomonas aeruginosa</i>	5
4	<i>Staphylococcus aureus</i>	7
5	<i>Vibrio</i>	6
6	<i>Shigella</i>	4

Autumn season (February- April)

Sl. No	Microorganisms	Total count
1	<i>Escherichia coli</i>	8
2	<i>Salmonella typhimurium</i>	5
3	<i>Pseudomonas aeruginosa</i>	7
4	<i>Staphylococcus aureus</i>	9
5	<i>Vibrio</i>	7
6	<i>Shigella</i>	8

Summer season (May-July)

Sl. No	Microorganisms	Total count
1	<i>Escherichia coli</i>	24
2	<i>Salmonella typhimurium</i>	8
3	<i>Pseudomonas aeruginosa</i>	5
4	<i>Staphylococcus aureus</i>	9
5	<i>Vibrio</i>	7
6	<i>Shigella</i>	6

The observation on the presence of bacteria in per 100 ml of water shows that *E. coli* & *Salmonella typhimurium* were found to be dominant in number having higher densities during the rainy seasons this generally implies that in areas where the sanitation facility is not properly developed has led to contamination of water resources. Since most of the water sample collected showed excessive growth of microorganisms, it can be considered as unfit for the intake by the people since it may also lead to various diseases.

CONCLUSION

All the water samples collected from the Saharsa region during the year 2019-2020 reflects the presence of *E. coli* & *S. typhimurium* in maximum in number obtained

from all the water resources. The study reveals the prevalence of pathogen such as *E. coli* & *S. typhimurium* more during the rainy season than the other seasons for groundwater resources since the sewage & other organic waste present in those areas get washed and enter the water resources. Thus bacteriological counts from well water, tubewells water, pond water samples make the water more unfit for the drinking purpose. Thus monitoring of water resources is required for improving the quality of water.

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