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Research Article

Bacteriological Evaluation of Groundwater for Potability from Pangri, (MS) India

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Abstract

An attempt of this study is to investigate the bacteriological analysis with reference to *coliform* concentration in drinking water. The interaction of microorganisms and water is known as water microbiology. Sources of *Coliform* are from animal and human waste discharge from the surroundings. Intestinal tract of humans and warm blooded animals contains bacteria that can cause diseases. The present study carried out for bacteriological quality of water from Pangri village by MPN test. Nearly five groundwater sampling sites fixed and collected water samples during August, 2015 to July, 2016. The water samples were collected in clean polyethylene bottles and were brought immediately to the laboratories for analysis. The *Coliform* number varied from 22 to 1600/100 ml. Observations indicated nearly all the water samples possess above permissible limit according to WHO standards.

INTRODUCTION

Water plays an important role for all living organisms present on earth. Due to the transfer of sewage waste directly into the natural water bodies, increases the bacterial contamination. Because of rain drainage gets blocked and this contaminated water body spreads on soil surface and gets percolate in ground. *Coliforms* get transferred through runoff of septic tank and sewage. Sewage water contains more bacterial contamination which affects groundwater quality from these pathogenic organisms causes diseases (Bhosle, 2001).

Bacteria like *Coliforms* make conceptual connection between fecal matters. If the water gets contaminated it shows its presence. Idea behind bacteriological analysis is to identify bacteria, virus and other microorganisms (Girdonia, 2011).

All living organisms require safe drinking water which should be free from pathogenic microorganisms. Generally *Escherichia coli* found less in number in an environment (Rompre *et al.*, 2001). Water plays an important role in biological process of human bodies because digestive and metabolic process depends on it (Nakade, 2013). According to WHO every year four billion peoples are suffering from diarrhea because of unsafe water (WHO, 2000).

Humans require fresh water with systematic treatment for drinking purpose to be healthy. Coliforms decrease the quality of water because they are found in gut of warm and cold blooded organisms also found in warm blooded animals (Salar *et al.*, 2014).

The supply of potable water to population in developed countries is an great issue nowadays. Unsafe water can cause diseases like dysentery, diarrheal and other chemical infections.

Groundwater is a good source for drinking purpose because soil profile restricts the pollution movement (Agwaranze *et al*., 2017).

Water is a basic requirement and most essential natural resource for all living organisms present on earth. Due to industries and domestic waste about 70 percent of water in India is polluted. The clean and pure water for drinking purpose is necessary for civilized population (Mahajan and Bhardwaj, 2017).

One of the most important and valuable natural resource water is wealth of our country. No life can survive without water which plays the important role in supporting life activities. Water has ability to contain living and non living like organic, inorganic, soluble and insoluble substances (Garode and Bhusari, 2017).

Consuming drinking water is an basic right of humans to maintain their health. Water having bacterial contamination is the source of gastroenteric diseases throughout world. Due to unsafe water there are deaths of 1.8 million peoples in developing countries. Diarrheal is one of the major killer disease found in children's. In developing countries it is found that there are 17 percent deaths in children's under the age of 5 years (Negera *et al.*, 2017).

MATERIALS AND METHODS

Water is essential for life but it is contaminated by different bacteria, hence it is necessary to treat systematically. Mostly to determine the bacterial quality of water most probable number (MPN) procedure is widely popular and applicable (Sengupta and Saha, 2013).

Total 30 samples were collected for two months to determine the bacterial contamination with reference to *coliform.* Presumptive and confirmative test was carried out to determine coliform concentration. During research he found that 3 samples were unfit to consume (Deshmukh, 2017). To maintain the hygienic quality of water the microbial assessment of drinking water is carried out. Followed the most common method MPN test to know the presence of E. Coli in drinking water. Total 36 samples were analysed and presence of E. Coli was 60 percent in drinking water (Chauhan *et al*., 2017).

The Pangri village covers about 547 hectares area which is situated in Nanded tehsil of Maharashtra. Latitude is $19^0$5'30''N and Longitude is $77^0$17'30''E. Pangri village comprises several hundreds of houses along with the population is about 1261. Peoples from this region always use groundwater as a source for drinking and other purposes.

About five different groundwater samples were collected once in a month from Pangri village. MPN test follows nearly in three steps, i.e. Presumptive test, Confirmatory test and Completed test from environmental analysis book of trivedi and goel (Trivedi and Goel, 1998). During experimental work precaution was taken to avoid the contamination if any. The MPN chart given by American Public Health Association, New York is used for counting concentration of MPN in groundwater (Standard Methods, 1998).

MacConkey broth prepared in single as well as double strength, which were autoclaved and distributed in test tubes, 10 ml, 5 ml and 5ml (10, 1, 0.1 ml dilution of distilled water) respectively. With water samples all these were incubated at 37^oC for 24 to 48 hours.

Endo Agar, EMB Agar and BGLB procedure completed for testing the presence of *Escherichia coli* from the selected water samples in the present work (Kumar *et al.,* 2013).

RESULTS AND DISCUSSION

Water sample for one year on monthly basis from Pangri village where drainage system and other waste dumping is nearby bore wells. Generally these bore wells are up to 150 feet in depth, hence groundwater gets contaminated. High number of *Coliform* in potable water can cause diseases like diarrhea, vomiting, crams in stomach, reduces urine etc. It happens because cell of *Coliform* produces shiga toxin which is harmful to human body and others. After investigating by MPN test *Coliform* were found above the permissible level. The values of MPN were ranged between 22 to 1600/ 100 ml of the water samples from the collected bore wells (Table 1). Variation of obtained results is shown in graphs from (Figure 1-6). By using Arc GIS software spatial analysis of sample (Figure 7-18). By using spatial distribution *E. Coli* is classified from low to high concentration. Groundwater samples are classified in different classes (Table 2).

The study on seasonal variations in bacterial contamination of drinking water from Bilaspur city of Chhattisgarh state was carried out. Total 90 samples were collected accept that few samples were found with bacterial contamination also identified the bacterial strain of *Escherichia Coli* (Shrivastava *et al.,* 2014).

Discussion

Overall investigation it is found that all results are above permissible limit, hence, the water should be disinfected by simple and suitable method like boiling before using for drinking purpose. We suggest all the surroundings must be made clean, avoid open dumping of garbage and other waste.

Table 1: Showing the Coliform numbers as MPN/100 ml during August, 2015 to July, 2016

Month	GW-1	GW-2	GW-3	GW-4	GW-5
Aug	1600	430	81	1600	170
Sep	920	350	430	430	220
Oct	1600	350	1600	1600	170
Nov	23	23	22	1600	1600
Dec	430	350	920	430	170
Jan	920	1600	81	430	540
Feb	81	920	180	1600	430
Mar	180	180	81	1600	430
Apr	22	40	31	81	31
May	920	1600	430	920	920
Jun	430	540	430	920	220
Jul	1600	1600	1600	920	920
Min	**22**	**23**	**22**	**81**	**31**
Max	**1600**	**1600**	**1600**	**1600**	**1600**
Ave	**727.1667**	**665.25**	**490.5**	**1010.917**	**485.0833**

Note: GW= Ground Water

Table 2: Groundwater quality classification

Water Class	Permissible Limit (WHO) MPN/100	No. of Samples
Excellent	0 - 5	-
Satisfactory	6 - 10	-
Unsatisfactory	10 Above	5

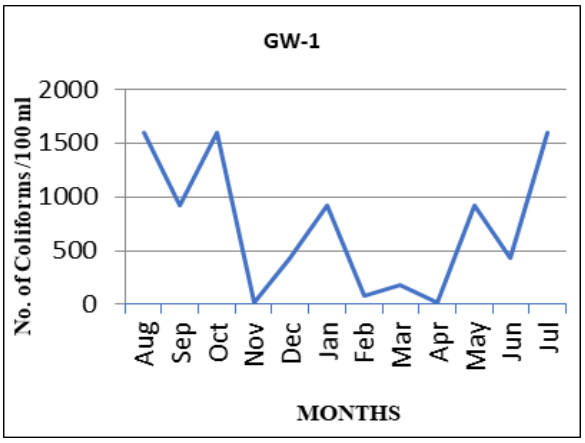

Figure 1: Values of MPN/100ml of Pangri village as GW-1.

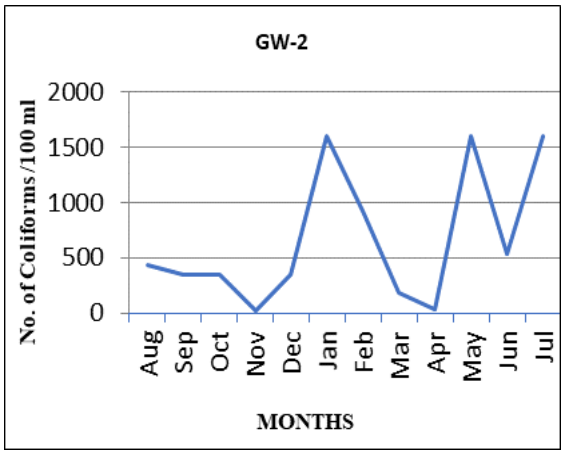

Figure 2: Values of MPN/100ml of Pangri village as GW-2.

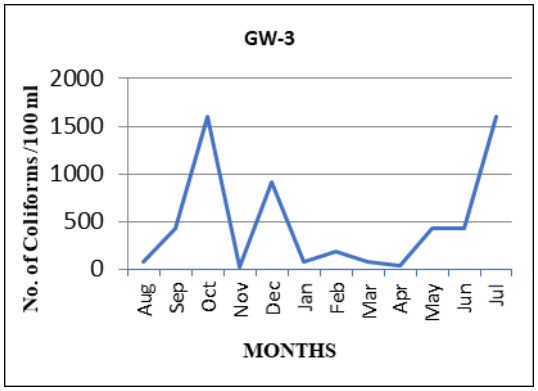

Figure 3: Values of MPN/100ml of Pangri village as GW-3.

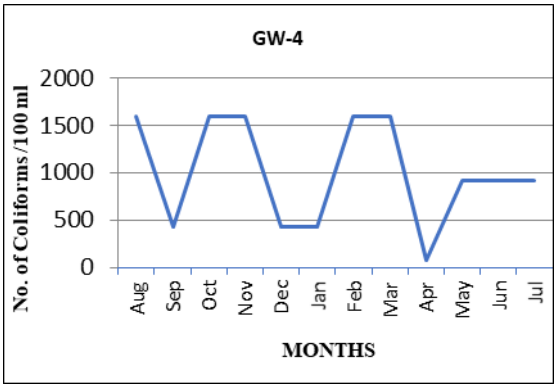

Figure 4: Values of MPN/100ml of Pangri village as GW-4.

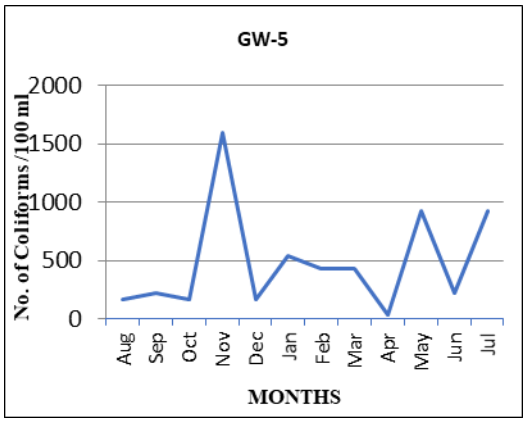

Figure 5: Values of MPN/100ml of Pangri village as GW-5

Figure 6: Values of MPN/100ml of Pangri village as showing Minimum, Maximum and Average values.

Spatial Distribution of MPN/100 ml from August, 2015 TO July, 2016

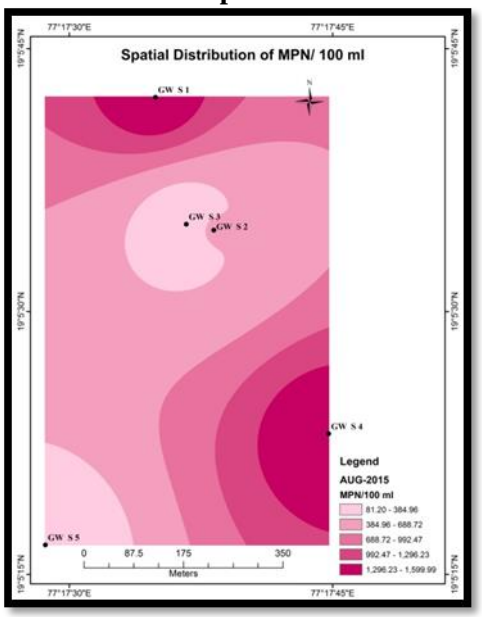

Figure 7

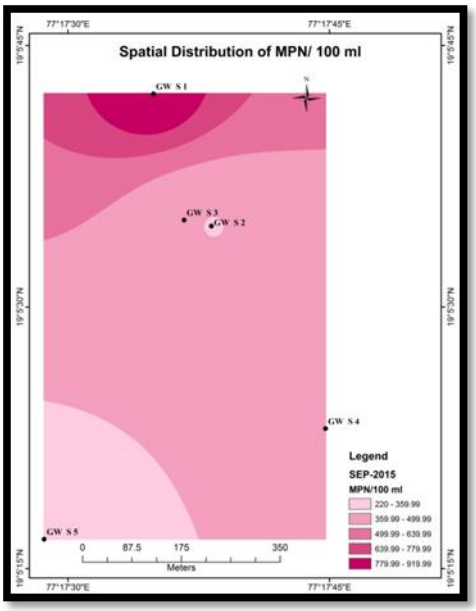

Figure 8

Figure 7 & 8: Showing the spatial distribution of MPN/100 ml during August and September month.

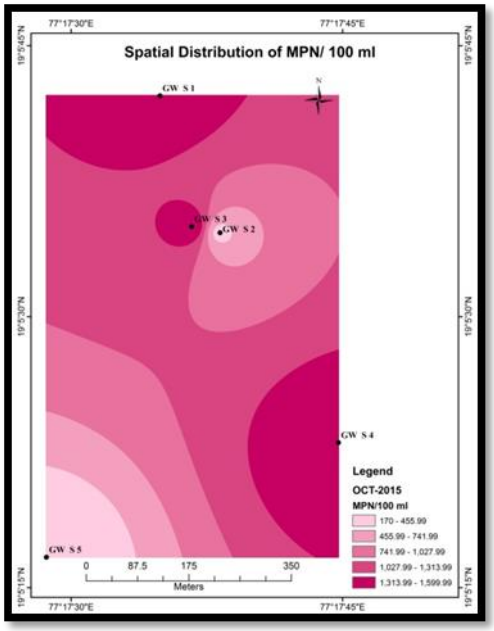

Figure 9

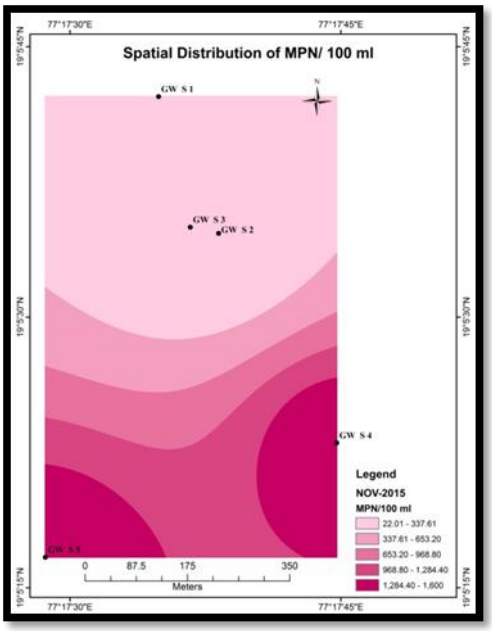

Figure 10

Figure 9 &10: Showing the spatial distribution of MPN/100 ml of October and November month.

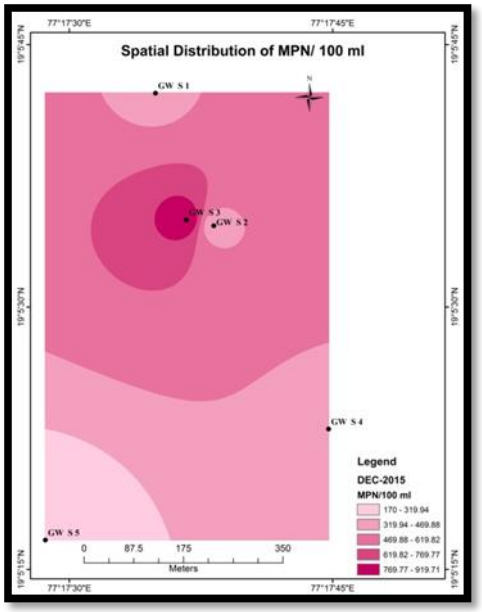

Figure 11

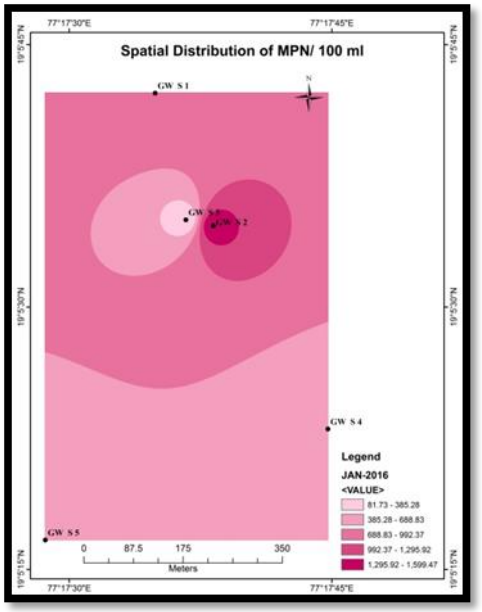

Figure 12

Figure 11 &12: Showing the spatial distribution of MPN/100 ml of December and January month.

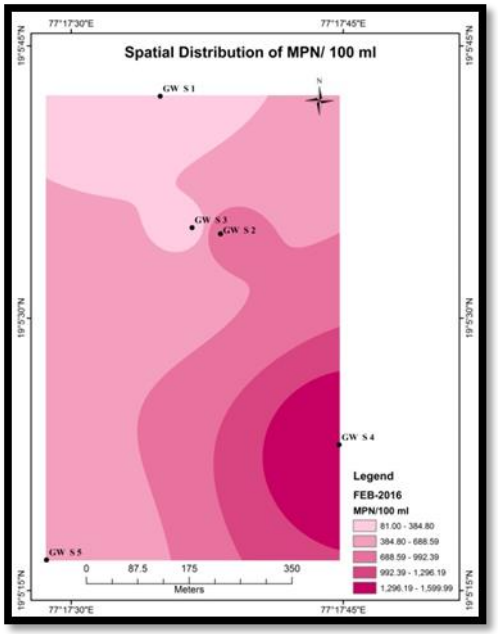

Figure 13

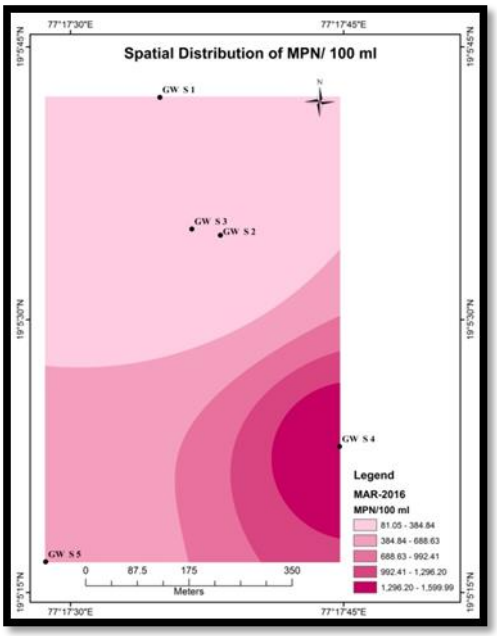

Figure 14

Figure 13 & 14: Showing the spatial distribution of MPN/100 ml of February and March month.

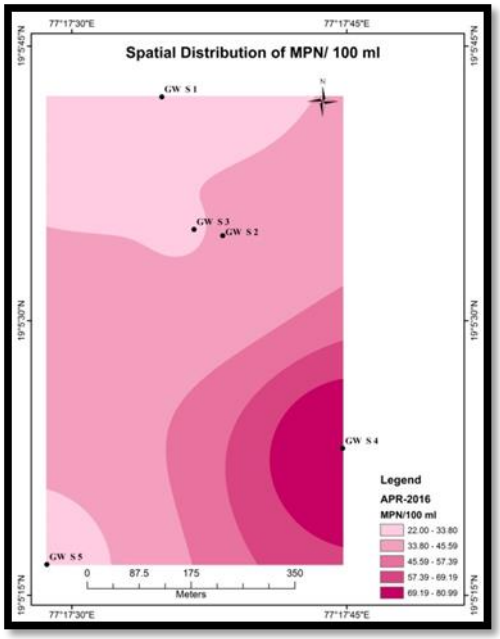

Figure 15

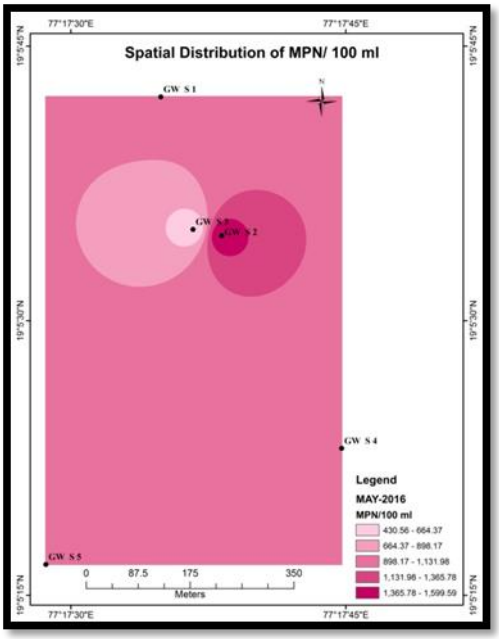

Figure 16

Figure 15 & 16: Showing the spatial distribution of MPN/100 ml of April and May month.

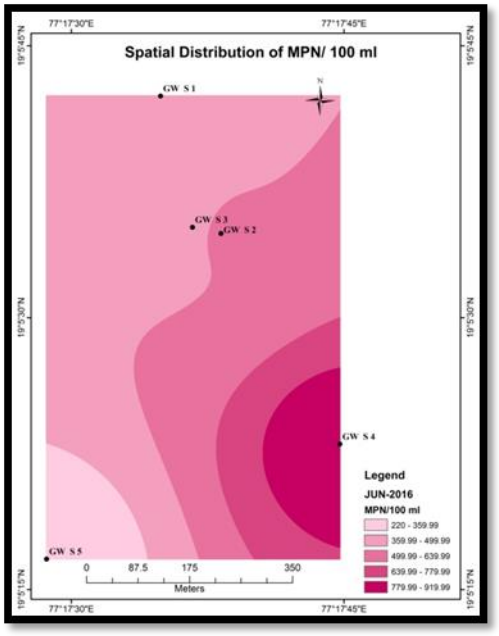

Figure 17

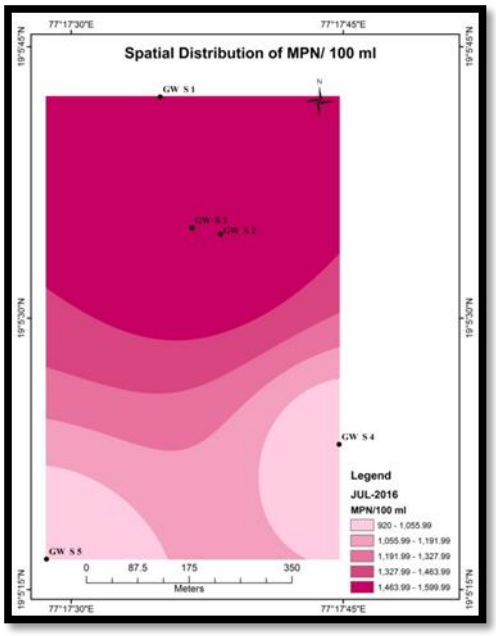

Figure 18

Figure 17 & 18: Showing the spatial distribution of MPN/100 ml of June and July month.

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