Assessment Of Chemical And Microbial Properties Of Ground Water Recharged Through Water Harvesting System In Sidhi m.P. India

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Abstract:-*This study undertaken to assess the physico-chemical and microbial activity of underground water recharged by water harvesting system ofsidhi town and Rampurnaikin town. From the collected samples the color PH, iron, total dissolved solid, salinity, electrical conductivity, acidity, alkalinity, chloride, total hardness, calcium and magnesium hardness and microbial activities were analyzed and studied. The result obtained were compared with the standard value of BIS (Bureau of Indian standards) and accordingly recommendation suggested.*
Keywords:- *Microbial activity, water harvesting drinking water, physic- chemical properties.*

I.   Introduction

The primary sources of drinking water are surface water and ground water. The ground water resources are being utilized for drinking purpose.

However due to continoues growth in population, urbanization, industrialization,and agricultural activities, ground water resources are under stress.Hence collection of rain water and conserving it for future need has been in practice now a days in India.

Rain water harvesting is an artificial process of augmenting the natural underground water. Rain water harvesting generally could be done by two ways either by surface run off or roof top water harvesting. The main problem arises with rain water particularly with roof top rain water storage is the dust and pollutants that accumulate during dry periods are swept into storage tank along with rain water and these pollutant and microbes can contaminate the water hence if this water is to be used for drinking purpose , then it is necessary to assess its quality.

In the present study the quality of underground water after its recharging through rain water harvesting system was taken to assess its quality whether it is drinkable or not.

II.   Material and Method

The ground water samples collected from the sidhi town and Rampurnaikin town at various locations four (04) sample from sidhi town and 03 samples from Rampurnaikin town were collected in sterilized bottle and stored at 4^0c till further investigation.

Thereafter with those collected samples the physic-chemical parameters such as PH, color, electrical conductivity salinity , alkalinity, acidity total dissolved solid (TDS) total hardness, Ca and mg hardness, chloride, total iron were analyzed according to standard methods.

Microbiological analysis was done as per iso 1988 international organization for standardization Geneva. (1988) standard plate count technique for total bacterial population and MPN (minimum portable number) test for presumptive coli form count was performed on all samples collected (07 samples). A Microbial count was made to obtain the presence of bacterial population. A water sample containing less than 100 bacteria per milliliter is considered to be good quality a total bacterial count was made by calculating the number of colonies appearing per tryptone glucose extract agar plats incubated at 20^0c and 37^0c for 72 and 24 hours respectively to which aliquots of water sample are added.

Four sterile petri plates with the sample amount i.e. two with 1 m.l. and another two within 0.1 m.l. water sample were laveled and water sample was mixed was thoroughly by shaking vigorously. Then melted and cooled ($45-50^0$c)nutrient agar medium was added to the inoculated plats and inoculums was mixed by rotating the plats for the uniform distribution of organism. One set of plats were incubated at $20-22^0$c for 72 hours and second set at 37^0c for 24 hours.

The plats for appearance of colonies were observed and the number of colonies was counted in all the plots for the two temperatures.

The colonies per milliliter of water sample were calculated by multiplying the number of the colonies in the plats by the sample size.

The multiple tube fermentation test or most probable number test in the most often used technique for the sanitary analysis of water. The test in performed sequentially in three stage, presumptive, confirmed and completed test.

In presumption coli forms test 10 ml of water sample were inoculated aseptically in 5 double strength lactose broth tube 1 ml and 0.1 ml of water sample were inoculated in 5 – single strength broth tube separately. All the 15 inoculated tube are incubated aerobically at 35^0c for 48 hours. All the lactose fermentation tube were examined for the production of acid (yellow color) and gas after 24 hours and 48 hours of incubation. Productions of acid (color change) and gas after 24 ours incubation indicates a positive presumption test for coli from bacteria the number of tubes showing the positive presumptions test were recorded.

Now the tubes showing positive presumption test are retained and used for confirmed test. Confirmed E. coli count was determined by preparing same subcultures from all the bottles. The media used were macconkey agar and Eosin methylene blue agar, the sub culture were incubated at 37^0c and 44^0c and examined after 24 hours.

Besides this each sample was inoculated on salmonella- shigella (ss agar) agar plates. The isolate were identified by morphological and biochemical test through colony morphology Gram staining and motility, indole, citrate, urease methyle red, V.P., hydrogen sulphite and sugar fermentation test.

The result obtained were compared with drinking water quality guidelines by CPHEEO (central public health and Environmental Engineering organizations) and standard set by the BIS (Burenue of Indian standards)

Table -1

Sample No.	Color	PH	TDS mg/L	Electrical conductivity	Total hardness	Ca mg/L	Mg mg/L	Alkalinity mg/L	Cl mg/L	Fe mg/L
1	2	3	4	5	6	7	8	9	10	11
1	Transparent	7.72	384	479	299	206	85.12	348.0	93.0	0.3
2	Transparent	7.93	373	418	290	160	120.92	392.0	82.0	0.2
3	Transparent	6.82	230	258	180	120	50.01	152.0	48.20	0.1
4	Transparent	7.99	418	450	230	165	75.82	335.0	65.1	0.1
5	Transparent	7.67	373	420	350	290	55.03	308.0	71.6	0.3
6	Transparent	8.11	420	387	293	155	130.92	344.0	33.7	0.1
7	Transparent	6.99	245	355	330	181	143.80	372.0	65.4	0.1

Sample 1 collectrateSidhi 2- AmhaSidhi   3- south karaundiyaSidhi 4- padainiyaSidhi 5- Bus stand Rampur naikin 6- near collage Rampur Naikin 7- near tehseelbhavan Rampur Naikin

Table -2

Sample No.	Cfu/ml.	MPN index/100 ml	Bacteria present
1	49	22	Negative
2	32	11	Negative
3	10	08	Negative
4	$1.18x10^2$	128	E.coli
5	11	08	Negative
6	16	18	Negative
7	55	12	E.coli

Result with Discussion

The Physico-chemical analysis of the underground water samples were determined and the result obtained are shown in **Table -1**

Result shows that PH of all the samples varied from 6.82 to 8.11 that in the water from south karaundiyais acidic in nature water with PH value of 6.82 while the water from near college bhavanRampurnaikin is basic with PH value of 8.11. The PH values of all the samples are within acceptable limit.

TDS of all the samples ranged from 230 to 420 mg/l are in the permissible limit.

Electrical conductivity values are in limit. Hardness of all samples found within the range of 180 to 350 mg/l means they fall in the category of hard and very hard water.

Calcium ranged from 120 to 290 mg/l it shows all the samples have high concentration of calcium magnesium ranged from 50.07 to 143.80 mg/l all are within the standard limit.

Alkalinity of samples varied from 152 to 392 mg/l all are within the range of standard limits.

The values of chloride also found in the range of standard limits the value of iron arealso found in the limits according to BIS standards.

The microbial analysis in standards in Table -2

The presumptive coli form count or MPN index/100 ml of the water samples ranged from nil to 128/100 ml it indicate that sample no.4 had the highest count of 128/100 ml followed by sample No.1 22/100 ml.The total plate count was also highest in sample No. 4 (1.18×10^2cfu/ml). The bacteria isolated on different selective media identified by biochemical test were Escharichia coli, Enterobacter species hence these water sample were contaminated.

III.   Conclusion

The study suggest that the underground water recharged by water harvesting system in the various location of sidhi town and Rampurnaikintwon is suitable for drinking purpose except sample no. 4 and 7 where certain E coli identified hence water from these sources cannot be used for drinking purposewithout pretreatment.

Reference

[1].   Water quality and Enumeration of viable microorganism colony count by inoculation in or on a solid medium international standard iso 1988.
[2].   Guidelines for drinking water quality drinking water control in small community supplies world health organization (WHO) Geneva volume 3 (2014).
[3].   Water quality and detection and Enumeration of coliform organism, thermo tolerant coliform organism and presumptive Escherichia coli part 2 multiple tube (most probable number) method International standard iso 9308-2 (2014)
[4].   BIS – Burneau of Indian standard act (1986)
[5].   Kihampac and wenaty A."impact of mining and farming activities on water and sediment quality of the mara river basin TANAZANIA Res. J. chem. Sci 3(7) 15-24 (2013)
[6].   Jain chandana, mendirattaRitu, Rojaantonynitinhada, Rohit Singh, "studies on changes in groundwater quality IJSR International Journal of scientific Research 2(7) 78 (2013)