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STUDY OF PHYSICO-CHEMICAL PARAMETERS AND ASSESSMENT OF GROUND WATER QUALITY IN BUDHANPUR TEHSIL DISTRICT - AZAMGARH (U.P.)

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ABSTRACT: Water is an important boon given by nature. Pure drinking water is very important for all humans otherwise different types of diseases will be produced. Physico-chemical parameter of water is determined the quality of water, it shows whether the water is potable or not. The water samples are collected twice from the nine sites selected different places of Budhanpur tehsil, sample were collected in April-May-2023 and August-September-2023. The physico-chemical parameters viz., colour, odour, turbidity, electrical conductivity (EC), total dissolved solid (TDS), hardness, chloride, calcium, pH were analyzed. All the water samples have transparent appearance and it does not show any turbidity. The present study examines all the sample have P^H above the 7 i.e. in these regions water is alkaline. Mostly sample show higher value of TDS the permissible limit indicates high value of ionic content. Dubayien Gopalganj have high amount of fluoride ion. Comparative studies of samples in different seasons were conducted and it was found that Electrical Conductivity and Total Dissoved Solids (TDS) were decreased. we hope this research provide awareness and importance of ground water.

Keywords- Physico-chemical parameter ; Electrical conductivity; TDS; Hardness; Chloride

1. INTRODUCTION

Water is an essential element of life. People cannot think of life without water on this planet. Human being used water for various purposes such as drinking, irrigation, industry, domestic water for energy production, sanitation, climate regulation, health and hygiene, economic development, environmental protection. Water is natural source present in three form solid, liquid and vapour. According to WHO reports that approximately 36% of urban and 65% of rural Indian were without access to safe drinking water [1]. Fresh water is one of the most important resources crucial for the survival of all the life. The consequences of urbanization and industrialization lead to spoil the water for agricultural purposes ground water is explored in rural especially in those. This is observed that ground water gets polluted drastically because of increased human activities.

Budhanpur is a town and tehsil in a azamagarh total area of budhanpur area is 423 square km. according to 2011 census budhanpur tehsil has population 4,59068. It is located at 26.10^0N and 82.31^0 E Coordinates.

2. MATERIAL AND METHODS

2.1 STUDY AREA: Azamgarh district located in the state of Uttar Pradesh, India. Azamgarh is district situated in the eastern part of the Uttar Pradesh. District with geographical area of 4,054 square kilometers, according to 2011 census population of Azamgarh district are 4,613913. Azamgarh has a subtropical climate with hot summers and mild winters. Azamgarh is surrounded by Tamsa river. It is divided into 8 tehsils, out of which Budhanpur Tehsil included about 474 villages. Burhanpur is a town and tehsil in Azamgarh district, covering a total area of 423 km^2. The tehsil has a population of 459,068. Groundwater occurs under both confined and unconfined conditions, depending on the weathered soil, which consists mainly of sandy loam and extends to deeper layers. There are main economic sources are agriculture. The study area have not major sources of surface water , the main sources of drinking water are open wells, hand pump and bore wells.

Table 1. Detailed locations of sampling sites of Budhanpur Tehsil

Sampling location	Sample ID	Latitude	longitude	source	Remark
Wazidpur	AZMGW-1	26.203	83.020	Handpump	Rural area
Rajkiya Mahila Mahavidyalaya	AZMGW-2	26.193	82.979	Handpump	Rural area
Basti Bhujwal	AZMGW-3	26.183	82.946	Handpump	Market
Koilsa Block	AZMGW-4	26.262	82.992	Handpump	Rural area
Bhedura	AZMGW-5	26.199	83.001	Handpump	Rural area
Atraulia	AZMGW-6	26.334	83.096	Handpump	Market
Kaptanganj Market	AZMGW-7	26.195	83.096	Handpump	Market
Budhanpur Market	AZMGW-8	26.272	83.005	Handpump	Market
Dubayegopalganj	AZMGW-9	26.198	83.002	Submersible	Rural area

2.2 Water sampling: All the samples used for analysis of physico-chemical parameter were collected from 9 point included villages and town area of budhanpur Tehsil, district Azamgarh. The sample were collected in pre- cleaned and rinsed plastic bottle of 250 mL with require precaution (Brown et. al. 1974). the sample were collected during April to June 2022 and October -2022 to March 2023 from manually.

3. PHYSICO – CHEMICAL PARAMETERS: The following physico-chemical parameter of all samples were analyzed. PH, total dissolve solid, bicarbonate ion, carbonate ion, nitrate ion, sulphate ion, chloride ion, fluoride, calcium, potassium, sodium, magnesium. The sample has been analyzed using standard method, according to

(APHA, 2005). All the chemical were used of AR Grade and double distilled water used for preparation of solution.

Details of the analysis are summarized in Table-2.

Table-2 physico- chemical parameter and methods employed in the analysis of water sample

S.No.	Parameter	Unit	Method Employed
1	P^H		Digital PH METER
2	Electrical Conductivity	µs/cm	Digital Electrical conductivity meter
3	Total dissolve solid (TDS)	mg/l	By gravimetric method
4	Bicarbonate ion	mg/l	Titration method
5	Chloride ion	mg/l	Argentometric titration method
6	Fluoride ion	mg/l	Ion chromatography
7	Nitrate ion	mg/l	Ion chromatography
8	Sulphate ion	mg/l	Ion chromatography
9	Ammonium ion	mg/l	Ion chromatography
10	Potassium ion	mg/l	Ion chromatography

Table -3 Physico-chemical parameters in April-May-2023 (Pre Monsoon Samples)

S.No.	Sampling Station	colour	Odour	turbidity	P^H	EC	TDS	HCO_3^-	F^-	Cl^-	SO_4^{2-}	$N0_3^-$	Na^+	K^+	Ca^{2+}
1	AZMGW-1	Colourless	Odourless	Clear	7.48	1.53	850	743.3	0.46	1.60	2.58	0.91	94.02	9.87	13.80
2	AZMGW-2	Colourless	Odourless	Clear	7.41	1.13	760	755.80	0.39	1.56	2.12	0.90	90.10	8.70	14.21
3	AZMGW-3	Colourless	Odourless	Clear	6.45	1.87	640	762.40	0.43	2.30	2.26	0.94	92.36	9.02	12.36
4	AZMGW-4	Colourless	Odourless	Clear	7.45	1.24	710	681.40	0.90	80.41	64.50	40.25	278.90	9.56	19.70
5	AZMGW-5	Colourless	Odourless	Clear	7.34	0.97	590	751.4	0.51	12.30	7.45	16.40	81.24	8.62	14.40
6	AZMGW-6	Colourless	Odourless	Clear	7.49	1.16	740	677.2	0.91	337	62.50	34.60	278.90	9.30	93.48
7	AZMGW-7	Colourless	Odourless	Clear	7.39	1.51	803	679.2	0.35	191.7	39.80	61.31	146.46	8.90	20.54
8	AZMGW-8	Colourless	Odourless	Clear	7.54	1.79	810	672.2	0.89	59.31	61.25	39.12	267.70	6.67	15.10
9	AZMGW-9	Colourless	Odourless	Clear	6.68	1.94	1230	1143.3	3.60	545.5	215.6	78.80	838.05	31.3	17.56
AVERAGE					7.24	1.46	792.5	762.9	0.93	136.8	50.8	30.35	240.8	11.32	24.57
Standard Deviation					0.39	0.353	183.7	147.6	1.02	190.2	67.6	28.04	240	7.54	25.9

Table-4: Physico-chemical parameters in August – September -2023 (Monsoon Samples)

S.No.	Sampling Station	Colour	Odour	Turbidity	PH	EC	TDS	HCO_3^-	F^-	Cl^-	SO_4^{2-}	NO_3^-	Na^+	K^+	Ca^{2+}
1	AZMGW-1	Colourless	Odourless	Clear	7.14	0.99	550	754.21	0.34	2.34	2.96	0.98	90.09	8.79	13.50
2	AZMGW-2	Colourless	Odourless	Clear	7.2	0.99	560	753.40	0.33	2.40	2.30	0.90	94.80	8.04	12.49
3	AZMGW-3	Colourless	Odourless	Clear	6.78	0.96	520	756.50	0.40	2.59	1.91	0.90	84.20	7.40	12.03
4	AZMGW-4	Colourless	Odourless	Clear	7.4	1.46	740	675.60	0.74	59.63	53.40	32.70	229.60	5.70	14.60
5	AZMGW-5	Colourless	Odourless	Clear	7.25	0.94	460	751.90	0.42	3.25	3.20	0.96	81.40	8.80	12.30
6	AZMGW-6	Colourless	Odourless	Clear	7.8	1.04	760	753.80	0.49	211.8	35.40	56.30	198.80	6.75	18.10
7	AZMGW-7	Colourless	Odourless	Clear	7.44	1.25	800	660.20	0.28	179.3	35.40	58.77	140.05	8.90	17.45
8	AZMGW-8	Colourless	Odourless	Clear	7.21	1.38	700	450.60	0.79	23.30	5.56	5.90	40.50	5.06	29.84
9	AZMGW-9	Colourless	Odourless	Clear	7.22	1.59	950	1150.1	2.54	530.4	205.2	74.10	830.40	23.2	13.40
AVERAGE					7.27	1.17	671.1	745.1	0.70	112.7	38.37	25.7	198.8	9.182	15.96
Standard Deviation					0.27	0.247	159.0	181.3	0.711	176.06	65.45	30.13	244.4	5.43	5.64

3. RESULTS AND DISSCUSSION: The result of the present studies reveals in the above Table 3-and 4 respectively. There are pre-monsoon data of the sample is a given in Table 3 and monsoon data is a given in a Table 4.

3.1 Colour, Odour and Turbidity: Every sample collected in a pre-monsoon or monsoon are clear and transparent. There is no fragrance in all water samples collected in the study area. Odour in water due to the presence of various types of microorganisms such as algae, fungi, bacteria, weeds etc. Both pre-monsoon and monsoon samples show no turbidity, suggesting a low level of organic content (Jain et al., 1996), likely due to a low water table that allows ample time and space for decomposition. As there is no industrial activity in the area under study, the organic matter is primarily of domestic origin and is largely biodegradable.

3.2 Electrical conductivity: Electrical Conductivity (EC) is a numerical measure. It is used to estimate the total dissolved ions (TDS) present in water. EC is a valuable tool for assessing water purity, as it provides an indication of how pure the water is. In a pre-monsoon value of electrical conductivity is a average (1.46) and SD (0.353),

whereas in a monsoon average (1.17) and SD (0.247) (Fig. 1). Mostly sample above the acceptable limit but below the permissible limit with comparatively to BIS.

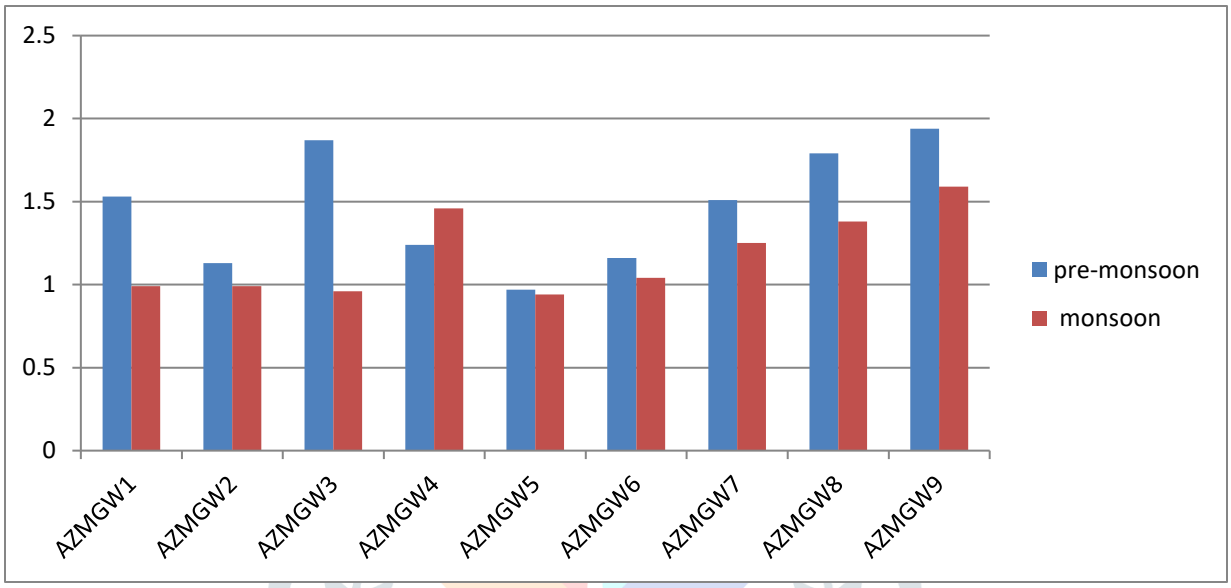

Fig.1 Variation of electrical conductivity in the study area

3.3 P^H: It measures the hydrogen ion concentration in the water. The value of pH will determine the acidic and alkaline nature of water, greater would be the concentration of sodium bicarbonate, magnesium carbonate, makes more alkaline nature of water. average pH is 7.24 and 7.27 which is in the permissible limit according to BIS.

3.4 Total dissolve solid (TDS): The total amount of dissolved solids (TDS) in water, which includes both organic and inorganic components, is measured. It measures average value 792.5 in a pre-monsoon and 671.1 in monsoon (Fig. 2). Dubayein gopalganj show high value 1230 In pre-monsoon, and 950 in monsoon.

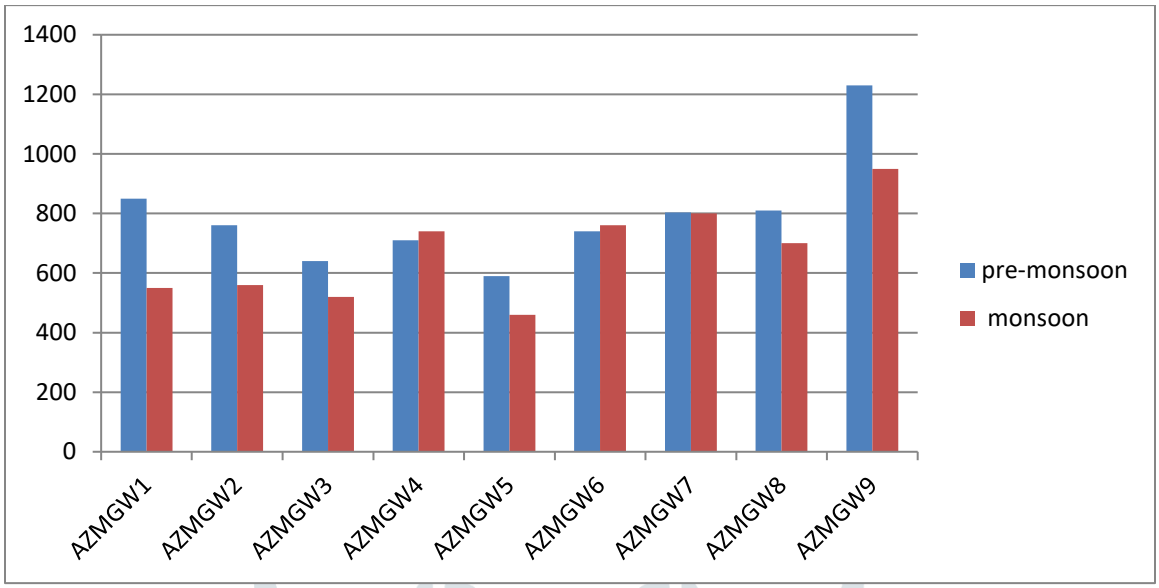

Fig.2 Variation of TDS IN THE STUDY AREA

3.5 Bicarbonate ion: The range of bicarbonate ion in the pre-monsoon from 672.2 mg/l to 1143.3 mg/l , with average value 762.9 mg/L, whereas in monsoon bicarbonate range is 450.60 mg/l to 1150.1mg/l with average value 745.1 mg/L. The elevated HCO^{3-} concentrations in these groundwater samples suggest the leaching and dissolution of carbonate and silicate minerals, as noted by Yadav et al. (2018) and Ram et al. (2021).

Fig. 3 Variation of bicarbonate ion IN THE STUDY AREA

3.6 Important Anions in the Water: The chloride content in Dubayegopalganj is 545.5 mg/L is very high comparison to various standards (WHO,2004 & ICMR,1985). The chloride content in April-May sample ranged from 1.60 to 545.5 mg/L (average 136.8) and in september sample ranged from2.34 mg/l to 530.4 t mg/L(average112.7). These data reveal mostly sample have value billow 250 mg/l as comparable to BIS.

Fluoride ion ranges from o.35 mg/l to 0.89 mg/l in pre monsoon (average value 0.93 mg/L). where as in the monsoon ranged from 0.35 mg/l to 0.79 mg/l with (average value 0.70 mg/l) which is in the permissible limit according to who and BIS. Dubayegopalganj reveal high value *i.e.* 2.54 mg/L. Major human-related sources of F- in groundwater include the use of phosphate fertilizers, aluminium smelting, glass manufacturing, and thermal power plants (Kundu and Mandal 2009; Ali et al. 2016).

The nitrate ion content in April-may sample ranged from 0.90mg/l to 78.8mg/l (average 30.3 mg/ l) and in september sample ranged from 0.90mg/l to 74.10 mg/l with(average value 25.7mg/l). The major source of NO_3^- is derived from decomposing of plants and animals undergoes ammonification and further leads to nitrification process, use of nitrogen containing fertilizers and disposal of untreated sewage (Begum et al. 2024).

The sulphate ion content in April-May sample ranged from 2.58 mg/l to 215.8mg/l (average 50.8 mg/ l) and in september sample ranged from 1.91mg/l to 205.2mg/l with (average value 38.37mg/l). all the sample have normal value.

3.7 Important Cation in the Water: The permissible limit of sodium ion in the drinking water is 20 mg/l to 250 mg/l (WHO). The highest value of sodium is 838.5 in Dubayegopalgan and lowest value of sodium ion is 81.40 in Bhedura.

The average value of potassium ion in premonsoon is 11.3 mg/l whereas in monsoon the average value is 9.18 mg/l which is find within the permissible limit. K^+ is the most important nutrient and its deficiency may cause hypokalemia in humans. The presence of K^+ in the groundwater comprises of mainly weathering of potash and silicate minerals (Yadav et al. 2018).

According to the Bureau of Indian Standards (BIS) for drinking water, the acceptable limit for calcium is 75mg/l. all the sample have normal value in the pre-monsoon and monsoon seasaon. the application of lime-based fertilizers plays a significant role in elevating Ca^{2+} levels in groundwater (Ganyaglo et al. 2011).

4. CONCLUSION: Present work concluded the seasonal changes of physicochemical parameter in the ground water and how these parameters play role in determine the water quality. The research reveals in Budhanpur Tehsil that some places have most of the parameter beyond the acceptable limit as prescribed by BIS and WHO, therefore these are not suitable for drinking. Although all parameters are not much high can not cause any serious issues. In most of the states, the problem of ground water depletion and quality deterioration has appeared in last few years.

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REFERENCES

1. O. Akoto and J. Adiyiah, Chemical analysis of drinking water from some communities in the Brong Ahafo region", International Journal of Environmental Science and Technology, 4(2) (2007) 211-214.
2. A.N. Jha and P.K. Verma Physico-chemical property of drinking water in town area of Godda district under Santhal Pragana, Bihar, Poll. Res. 19(20) (2000) 245-247.
3. APHA (1995), Standard methods for the examination of water and waste water, 16th Edition, American Public Health Association, Washington DC.
4. BIS (Bureau of Indian Standard) Indian standard specification for drinking water (1992).
5. Ranjana Agrawal, Study of physico-chemical parameters of groundwater quality of dudu town in Rajasthan, Rasayan J. Chem. 2(4) (2009), 969-971.
6. C.K.S. Jain, S. Kumar and K.K.S. Bhatia, Ground water quality in Western Uttar Pradesh, Ind Jou. Env. Health 28(2) (1996) 105-112
7. S. Yadav and S. Alaudddin, International Journal of Emerging Technologies in Engineering Research (IJETER) 5 (10) (2017) 24-26.
8. Nagarajan Prabavathi, Kavitha B, Jeyakar Chellaraj DA, Raja RE. Indian J. Environ. Prot., 21(1) (2000) 51.