

Physical and Chemical Analysis of Ground Water Quality during Pre-Monsoon Season in khol Block of District Rewari, Haryana (India)

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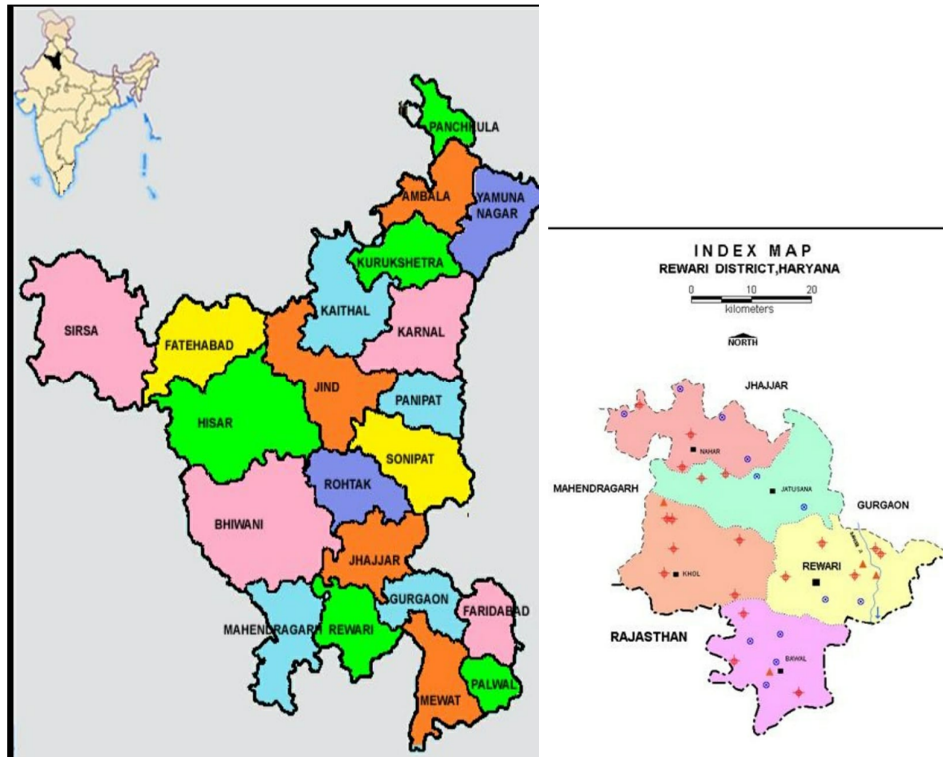
Abstract:- The Ground Water is a major source of drinking water in both urban and rural India. Therefore it is necessary that the quality of drinking water should be checked at regular intervals like during pre-monsoon and post-monsoon. In the present research paper, the ground water samples were collected during pre-monsoon season from 15 selected locations of Khol block of district Rewari, Haryana (India). The ground water quality was assessed by different Physical and Chemical parameters such as Total Dissolved Solids (TDS), Total Hardness (CaCO₃), Calcium (Ca), Magnesium (Mg), Iron (Fe), Chloride (Cl), Sulphate (SO₄), Fluoride (F), Nitrate (NO₃), PH and Alkalinity. The results were compared with drinking water standards of Indian and World Health Organization (WHO). It was found that the quality of ground water varied spatially.

Key Words :- Khol block, Ground water, pH, Mg, Fe, Per-monsoon, Physical and Chemical parameters and BIS-10500:2021.

Introduction :- The ground water resources are being utilized for drinking, irrigation and industrial purpose. Ground Water is an essential and vital natural resource of our life support system. But due to rapid increasing in population, industrialization, use of fertilizers and human made activities, it is highly polluted with different harmful contaminants. The ground water quality is generally characterized by different Physical and Chemical parameters such as Total Dissolved Solids (TDS), Total Hardness (CaCO₃), pH, Calcium (Ca), Magnesium (Mg), Iron (Fe), Chloride (Cl), Sulphate (SO₄), Fluoride (F), Nitrate (NO₃), Alkalinity pose very serious health problems in India.. These parameters change widely due to various seasons like pre-monsoon and post-monsoon. The Objective of this research work is to determine the Physical and Chemical contamination during pre-monsoon season in selected locations of Khol block of district Rewari, Haryana (India).

Location of Study :- The block Khol is East part of district Rewari, Haryana (India). In geographical term the location of study area is 22⁰05' North latitude and 72⁰22' East legislative. The geographical area of Khol block is 275.24 sq. km. which is spread in 62 villages. The average annual rainfall is 560 mm and total irrigated area is

171.69 sq. Km in study area. Here the hottest months are May- June and coldest month are December-January. The temperature of study area varies from 28⁰ C to 43⁰ C in summer and 6⁰ C to 21⁰ C in winter.



Ground Water Sampling and Testing : - Ground water samples were collected from different villages such as Ahrod, Bhandor, Dhamlawas, Dhawana, Harjipur, Khaleta, Kund, Kolana, Nimoth, Manethi, Mayan, Pali, Pithrawas, Parla and Punsika in Khol block of district Rewari, Haryana (India). Ground water samples were collected from Hand pump, Tube-wells and Bore-wells during pre-monsoon season. Ground water samples were collected in pre-cleaned and rinsed bottles of one litre capacity with necessary pre-cautions during pre-monsoon. Each of the ground water samples were analyzed by different Physical and Chemical parameters such as Odour, Total Dissolved Solids (TDS), Total Hardness (CaCO₃), pH, Calcium (Ca), Magnesium (Mg), Iron (Fe), Chloride (Cl), Sulphate (SO₄), Fluoride (F), Nitrate (NO₃) and Alkalinity.

Ground Water Quality Parameters: - The results of various physical and chemical parameters were analyzed by prescribed Indian Standards as per BIS-10500: 2012 and World Health Organisation (WHO). These standards are given below :-

Sr. No.	Parameters	Units	Indian Standard BIS-10500:2021 (Acceptable Limit)	WHO Standard (Acceptable Limit)
1	Odour	-	Agreeable	Agreeable
2	Total Dissolved Solids (TDS)	mg/l	500	500
3	Total Hardness (CaCO ₃)	mg/l	200	100
4	Ph	-	6.5-8.5	6.5-9.2
5	Fluoride (F)	mg/l	1.0	1
6	Calcium (Ca)	mg/l	75	75
7	Magnesium (Mg)	mg/l	30	30
8	Iron (Fe)	mg/l	0.3	0.1
9	Chloride (Cl)	mg/l	250	250
10	Sulphate (SO ₄)	mg/l	200	200
11	Nitrate (NO ₃)	mg/l	45	45
12	Alkalinity	mg/l	200	200

Results and Discussions:- The results of various Physical and Chemical parameters of Ground water of Khol Block of District Rewari, Haryana (india) during pre-monsoon season are shown in table below :-

Sr. No	Name of vill.	Odour	TDS	CaCO ₃	pH	F	Ca	Mg	Fe	Cl	SO ₄	NO ₃	Alkalinity
1	AHROD	None	470	270	7.8	0.68	74.1	28.3	0.02	90	39	8.5	210
2	BHANDOR	None	500	90	8.8	3.01	14	14.1	0.02	60	24	0.7	450
3	DHAMLAWAS	None	460	150	8.8	0.54	32	28.1	0.02	80	38	0.8	160
4	DHAWANA	None	270	120	7.8	0.8	18.2	14.2	0.02	80	52	2.2	130
5	HARJIPUR	None	480	80	8.9	3.32	12.1	16.1	0.03	68	28	0.8	470
6	KHALETA	None	260	110	7.4	0.6	20.1	13.5	0.03	90	42	1.9	110
7	KUND	None	920	280	9.1	0.8	22.1	56.1	0.05	290	48	9.8	270
8	KOLANA	None	1380	170	8.4	1.42	22.1	27.1	0.1	250	198	5.4	490

9	NIMOTH	None	1290	180	8.9	1.22	2.08	29.1	0.1	290	230	6.1	520
10	MANETHI	None	890	270	9.5	0.7	22.1	54.1	0.07	310	485	8.9	290
11	MAYAN	None	1250	470	8	0.94	38	86.1	0.1	380	124	17.1	160
12	PALI	None	1580	260	8.7	1.32	42	38.2	0.02	460	35	1.6	450
13	PITHRAWAS	None	440	160	8.5	0.59	30.1	26.1	0.01	70	36	0.7	140
14	PARLA	None	1310	430	6.9	0.8	14.1	96.2	0.02	350	72	15	260
15	PUNSIKA	None	1430	330	6.8	0.7	26.1	66.1	0.01	370	58	8	390

Discussions : - n Comparing the obtained results with Indian Standards as per BIS-10500: 2012 and World Health Organisation (WHO), the discussion of various Physical and Chemical parameters of Ground water of Khol Block of District Rewari, Haryana (india) during pre-monsoon is given below : -

Odour : - The odour in water may be due to the presence of mineral salt, decomposing organic matter, mineral salt, chemical compound etc. In the present study, all the ground water samples were odourless.

Total Dissolved Solids (TDS) - In the present analysis TDS ranged from 260 mg/l to 1580 mg/l was found. The maximum TDS (1790 mg/l) was found at Pali village and minimum TDS (680 mg/l) was found at Khaleta village. The TDS value should be below than 500 mg/l for drinking water according to WHO and Indian standards.

Total Hardness (CaCO₃) - The Total Hardness (CaCO₃) ranged from 80 mg/l to 470 mg/l was found in the present analyses. The maximum Hardness (CaCO₃) i.e. 470 mg/l was found at Mayan village and minimum Hardness (CaCO₃) i.e. 80 mg/l was found at Karjipur village. The acceptable limit of Total Hardness is 200 mg/l according to Indian Standards and WHO.

pH – The pH acceptable limit is 6.5 to 8.5 according to Indian Standards and WHO. In the present study pH ranged from 7.1 to 9.5 was found. The maximum pH (9.5) was found at Manethi village and minimum pH (7.1) was found at Punsika village.

Fluoride (F) – The Fluoride (F) ranged from 0.59 mg/l to 3.32 mg/l was found in the present analyses. The maximum Fluoride (F) i.e. 3.32 mg/l was found at Harjipur village and minimum Fluoride (F) i.e. 0.59 mg/l was found at Pithrawas village. The acceptable limit of Fluoride (f) is 1.0 mg/l according to Indian Standards and WHO.

Calcium (Ca) – In the present analysis, Calcium (Ca) ranged from 2.08 mg/l to 74.08 mg/l was found. The maximum Calcium (Ca) i.e. 74.08 mg/l was found at Ahrod village and minimum Calcium (Ca) i.e. 2.08 mg/l was found at Nimoth village. The acceptable limit of Calcium (Ca) is 75 mg/l according to Indian Standards and WHO.

Magnesium (Mg) – Magnesium (Mg) ranged from 13.48 mg/l to 96.22 mg/l was found in the present research work. The maximum Magnesium (Mg) i.e. 96.22 mg/l was found at Parla village and minimum Magnesium (Mg) i.e. 13.48 mg/l was found at Khaleta village. The acceptable limit of Mg is 1.0 mg/l according to Indian Standards and WHO.

Iron (Fe) – In the present research paper, it was found that the Iron (Fe) is in the acceptable limit in all the ground water samples according to Indian Standards and WHO.

Chloride (Cl) – Chloride (Cl) ranged from 60 mg/l to 660 mg/l was found in the present study. The maximum Chloride (Cl) i.e. 660 mg/l was found at Pali village and minimum Chloride (Cl) i.e. 160mg/l was found at Bhandor village. The acceptable limit of Chloride (Cl) is 250 mg/l according to Indian Standards and WHO.

Sulphate (SO₄) – In the present research paper, Sulphate (SO₄) ranged from 24 mg/l to 485 mg/l was found. The maximum Sulphate (SO₄) i.e. 485 mg/l was found at Manethi village and minimum Sulphate (SO₄) i.e. 24 mg/l was found at Bhandor village. The acceptable limit of Sulphate (SO₄) is 200 mg/l according to Indian Standards and WHO.

Nitrate (NO₃) – In the present analysis of ground water, Nitrate (NO₃) ranged from 0.7 mg/l to 17.1 mg/l was found. The maximum Nitrate (NO₃) i.e. 17.1 mg/l was found at Mayan village and minimum Nitrate (NO₃) i.e. 0.7 mg/l was found at Bhandor and Pithrawas villages. The acceptable limit of Nitrate (NO₃) is 11.4 mg/l according to Indian Standards and WHO.

Alkalinity - In the present research paper, Alkalinity ranged from 110 mg/l to 520 mg/l was found. The maximum Alkalinity (520 mg/l) was found at Nimoth village and minimum Alkalinity (110 mg/l) was found at Khaleta village. The acceptable limit of Alkalinity is 200 mg/l according to Indian Standards.

Conclusion: - The Physical and Chemical parameters of ground water samples which were collected from different villages of Khol Block of District Rewari, Haryana (India) were analyzed during pre-monsoon season. On the basis of Physical and Chemical analysis of the ground water samples of block Khol, it has been observed that the Physical and Chemical parameters such as Colour, Odour, pH, Calcium (Ca), Sulphate (SO₄) and Nitrate (NO₃) are within the acceptable limit prescribed by Indian Standards as per BIS-10500: 2012 and World Health Organisation (WHO) and some other Physical and Chemical parameters such as Total Dissolved Solids (TDS), Magnesium (Mg), Total Hardness (CaCO₃) and Alkalinity are not in the acceptable limit prescribed by Indian Standards as per BIS-10500: 2012 and World Health Organisation (WHO). It has also been observed that the remaining Physical and Chemical parameters like Iron (Fe), Chloride (Cl) and Fluoride (F) are within acceptable limit at some sites and are not in acceptable limit at some other sites according to prescribed limit of Indian Standards as per BIS-10500: 2012 and World Health Organisation (WHO). It has been concluded that the Physical and Chemical parameters of ground water quality varied spatially. Therefore, the quality of drinking

water must be checked at regular intervals, because due to the use of contaminated drinking water, the human population suffers from a variety of water-borne diseases.

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References:-

1. Khan S. U., Noor A. and Farooqi I. H. ,GIS application for Ground water Management and Quality Mapping in Rural Area of Distt. Agra, India, In: Int. J. of Water Resources & Arid Env, 2015, Vol, 4, pp 89-96.
1. Patel T. et. al. (2016), Physical and Chemical Analysis of Ground Water Quality of Dhrol, In: Int. Journal of Research in Engineering and Applied Sciences, ISSN: 2455-6300, Vol: 1(9), pp:11-12.
2. Kumar V., at. al. (2017), Survey and Characterization of Groundwater Quality in Rewari Block of District Rewari, Haryana, In: International Journal of Chemical Studies, ISSN: 2349-8528, pp: 2070-2074.
3. Nupur Jain, et.al., Fluoride Contamination In Ground Water In Parts of Barmer District, Rajasthan, India, In. J. of Innovative Research In Science, Engineering And Technology, Vol. 4, Issue 7,5915-5922, (2015).
4. A. Greenhalgh (March 2001), Healthy living-Water, BBC Helath, Ret. 2007-02-19.
5. Central Ground Water Board, Department of Water Resources, Ministry of Jal Shakti, Government of India, (2019).
6. D. P. Gupta, Sunita and J. P Saharan., (2009), Physical and Chemical Analysis of Groundwater of Selected Area of Kaithal City (Haryana), India. In: Researcher, Vol. 1 (2), pp 1-5.
7. Bureau of Indian Standards (BIS), Indian standard specification for drinking water, second revision, IS 10500:2012, Bahadur Shah Zafar Marg New Delhi, (2012).
8. B. K. Kortatsi (2007), Groundwater quality in wassa West District of The Western Region of Ghana. West African Journal of Applied Ecology, 11, 1.
9. WHO (World Health Organization), Guideline for drinking water quality, Second edition, Vol 2.
10. Gupta, B. K. at. al (1999). Physio-chemical and biological study of drinking water in Satna, Madhya Pradesh. Poll. Res. 18: 523-525.
11. S. Radhey, Kalwania G. S., (2011), Groundwater Chemistry: A Case Study Of Eastern Part Of Sikar City (Raj), India. In: Int. J. of Applied Eng. R., Vol. 2, 367-378.
12. Boral. S. B. (2012), Underground Drinking Water Study by Physico Chemical Analysis. In: J. of Chem. and Ph. Res., vol. 4(5), 2603-2606.

13. S. K. Jaiswal et. al. (2017), Changes in WQI of Different Ghats of Ganges River in Patna, Bihar. In: Int. J. of Emerging Trends in Sc. & Tec., Vol. 4, Issue 8, pp 5549-5555.
14. Central Ground Water Board, Department of Water Resources, Ministry of Jal Shakti, Government of India, (2019).
15. Raja R E, Lydia Sharmila, Princy Merlin, Chritopher G, Physical and Chemical Analysis of Groundwater of Kotputli Town Jaipur, Raj., Indian J En Prot., 22(2), 137, (2002).
16. Gangurde K. (2017), Ground Water Quality and Level in Haryana, India : A Review, ISSN:22787:8808, Vol-4/29, pp: 4806-4814.