G- Journal of Environmental Science and Technology

(An International Peer Reviewed Research Journal)

Available online at http://www.gjestenv.com

Assessment of diverse resources of ground water quality in Budaun district (U.P.), India

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ARTICLE INFO

Received: **11 Sep 2013**
Revised : **10 Oct 2013**
Accepted: **26 Nov 2013**

***Key words*:**
Ground water, Budaun, Dissolved oxygen, Hardness, Total dissolved solids

ABSTRACT

Ground water is one of most important source of the domestic water use. The water supply bodies' i.e. Municipal Corporation Jal nigam, or Nagar nigam are mainly depends on the ground water resources of the area. In the light of all these facts the work was demonstrate in the Budaun city to access the current ground water quality of the city.

The minimum to maximum temperature value was observed 20.4^{o}C to 21.6 ^{o}C while pH value ranged between 7.0 to 7.5. The minimum to maximum Turbidity value was observed 4.1 to 4.6 NTU. The minimum to maximum Dissolve Oxygen value was observed 4.0 to 4.9mg/lit. The minimum to maximum TDS value was observed 335 to 369 mg/l. The minimum and maximum Total Hardness value was observed 119 and 135 mg/l. The minimum to maximum Calcium Hardness value was observed 64 to 75 mg/l. The minimum to maximum Magnesium Hardness value was observed 24 to 30 mg/l. The result comes out of study shows that the ground water is fit for consumption.

1) INTRODUCTION

Water has a profound influence on human health and quality of the water supplied is important in determining the health of individuals and whole communities. Safe water quality is a major concern with reference to public health importance as health and wellbeing of the human race is closely tied up with the quality of water used [1]. The physico-chemical contaminants that adversely affected the quality of groundwater is likely to arise from a variety of sources, including land application of agricultural chemicals and organic wastes, infiltration of irrigation water, septic tanks, and infiltration of effluent from sewage treatment plants, pits, lagoons and ponds used for storage [2].

Water is an indispensable natural resource on earth. Safe drinking water is the primary need of every human being. Fresh water has become a scarce commodity due to over exploitation and pollution of water. Groundwater is the major source of drinking water in both urban and rural areas [3]. Groundwater is the most important source of water supply for drinking, irrigation and industrial purposes. Increasing population and its necessities have lead to the deterioration of surface and sub surface water [4]. Water is polluted on all the surfaces of earth are no exception to this phenomenon. All metabolic and physiological activities and life processes of aquatic organisms are generally influenced by such polluted waste and hence, it is essential to study physico-chemical characteristics of water.

Ground water is the major source of water for drinking, agricultural, and industrial desires. The availability of water determines the location and activities of humans in an area and our growing population is placing great demands upon natural fresh water resources [5]. The physico-chemical contaminants that adversely affected the quality of groundwater is likely to arise from a variety of sources, including land application of agricultural chemicals and organic wastes, infiltration of irrigation water, septic tanks, and infiltration of effluent from sewage treatment plants, pits, lagoons and ponds used for storage [6]. Rajappa et al. [7], Patil et al. [8], Kamble et al. [8] amd Zamxaka et al. [9] are prominent chemist importantly contributed to assessed the quality of ground water.

2) MATERIAL AND METHODS

Study Area: Underground water samples were taken from different sites of District Budaun in six months. Different sampling sites namely **Budaun Roadways** (**SS1), Ujhani (SS2), Bilsi (SS3), Bitroi (SS4), Kakora (SS5), Binawar (SS6)** were taken for the study.

Sample storage and preservation: To minimize the potential for volatilization or biodegradation between sampling and analysis, samples are kept as cool as possible without freezing. Preferably pack samples in crushed or

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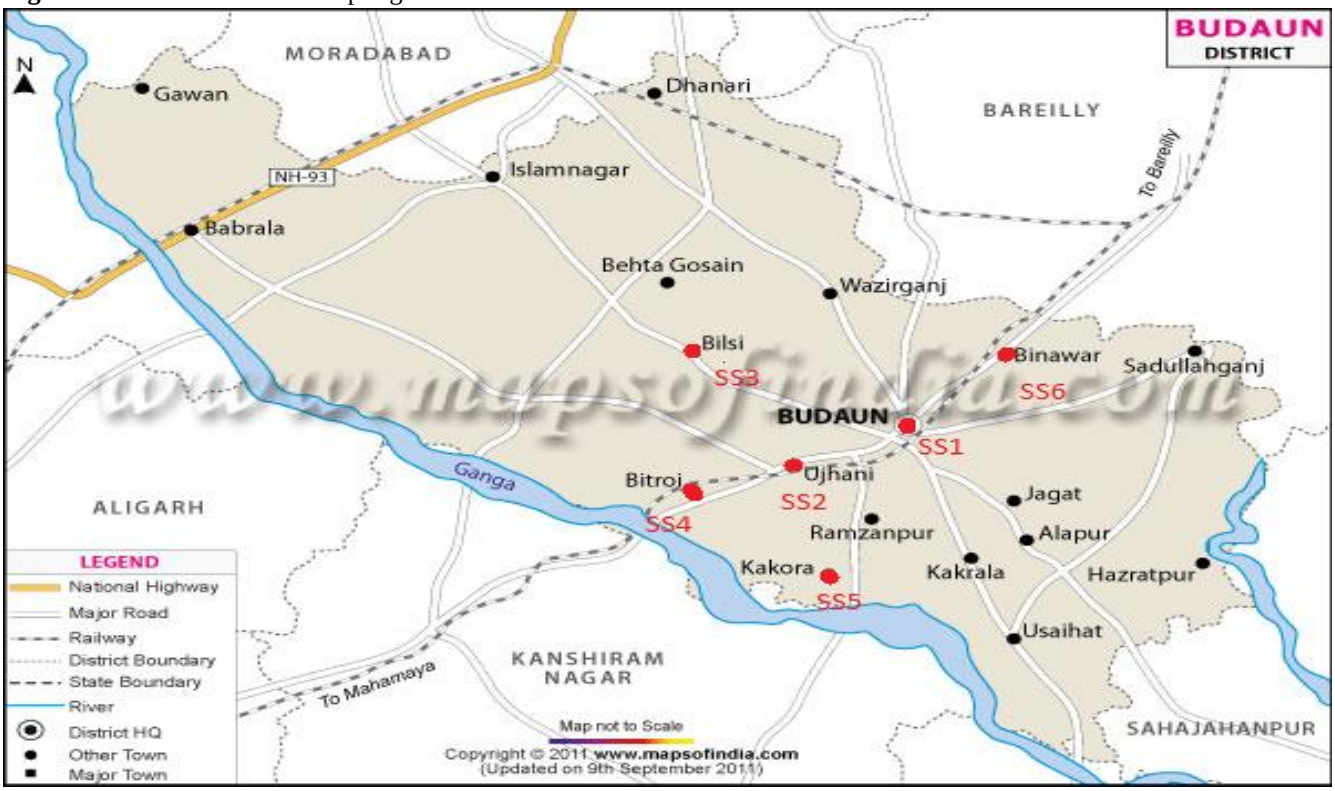
Fig 1: Location of different sampling sites:



cubed ice or commercial ice substitutes before shipment. Dry ice was avoided because it will freeze samples and may cause glass containers to break. Dry ice also may effect a pH change in samples. Samples are kept cool with ice or a refrigeration system set at 4ºC during compositing. Samples are analyzed as quickly as possible after arrival at the laboratory.

PARAMETERS: pH, TDS, Total Hardness.

- **pH:** pH is the measure of the intensity of acidity or alkalinity and measures the concentration of hydrogen ions in water. It was measured by using the pH meter.
- **TDS:** Total dissolved solid or simply solids are mainly the inorganic mineral and some organic matter. There are large unity of state such as Cl^-, CO_3^-, HCO_3^- , NO_3^-, PO_4^{-3}, and SO_4^{-2} of Ca, Mg, Na, K, & Fe etc which import certain taste to water measurement .
- **Total Hardness:** The total hardness in water is defined as the summary concentration of calcium and magnesium cations expressed in milligram equivalent ions present in water and the standard formula id used for the Calcium hardness, magnesium hardness and total hardness .

  Hardness as mg/l $CaCO_3$ = $\frac{TV \times 1000}{Ml\ of\ sample}$

  Where TV = *Volume of EDTA used*

- **Calcium hardness:** Many indicators such as ammonium purpurate, calson form a complex with only calcium but not with magnesium at higher pH

  Calcium or $CaCO_3$ (mg/l) = $\frac{volume\ of\ EDTA\ used \times 1000}{volume\ of\ sample\ used}$

- **Magnesium Hardness:** Magnesium hardness can be calculated by applying following formula:

  Magnesium (mg/l) = total hardness - calcium hardness

3) RESULTS AND DISCUSSION

The BIS for physico-chemical characteristics of Ground water of the study area are presented in given table:

S. No.	Parameter	Requirement Desirable Limit
1.	Temperature	--
2.	Ph	6.5-7.5
3.	Turbidity	10 NTU
4.	Dissolve Oxygen	5 mg/lit
5.	Total Dissolved Solid	500 mg/lit
6.	Total Hardness	300 mg/lit
7.	Calcium Hardness	75 mg/lit
8.	Magnesium Hardness	30 mg/lit

The value of different physico-chemical parameters observed in the whole study is given below:-

Temperature: The temperature of underground water ranged from a minimum of 22.1 ^{0}C to a maximum of 22.2 ^{0}C in SS1 and SS6 respectively (Table-1). Temperature variation occurs due to change in earth temperature. During the present investigation, there were no great variations obtained in the temperature of the underground water. This shows the average variation during the whole study.

pH: The pH of underground water ranged from a minimum of 7.0 to a maximum of 7.5 of SS1 and SS6 respectively (Table-2). During the present investigation a pattern of pH change was noticed. In underground water the maximum value of pH, which indicates the alkaline nature of water might be due to high temperature that reduces the solubility of CO_2.

Table-1:- TEMPERATURE value observation during six month at various sampling sites:

	OCT	NOV	DEC	JAN	FEB	MAR
SS1	22.1	21.4	21.1	18.2	19.9	20.4
SS2	21.5	22.4	19.3	19.2	18.4	20.9
SS3	23.7	21.9	20.1	19.3	20.2	21.1
SS4	20.7	19.3	18.8	20.2	20.8	21.6
SS5	21.3	22.8	19.3	19.4	19.3	21.2
SS6	22.2	20.4	20.9	19.5	18.4	20.8

Table-2:- pH value observation during six month at various sampling sites:

	OCT	NOV	DEC	JAN	FEB	MAR
SS1	7.5	7.5	7.2	7.0	7.2	7.5
SS2	7.5	7.3	7.1	7.4	7.6	7.3
SS3	7.2	7.1	7.5	7.4	7.1	7.1
SS4	7.1	7.4	7.3	7.3	7.4	7.2
SS5	7.2	7.2	7.3	7.1	7.2	7.4
SS6	7.5	7.1	7.3	7.5	7.4	7.5

Turbidity: The turbidity of the ground water was ranged from a minimum of 4.1 NTU and maximum of 4.6 NTU of SS1 and SS5 respectively (Table- 3). The variation of turbidity is due to the lower water table and the presence of sand and soil particles in it.

Table-3:- TURBIDITY value observation during six month at various sampling sites:

	OCT	NOV	DEC	JAN	FEB	MAR
SS1	4.1	4.5	4.2	4.4	4.1	4.4
SS2	4.2	4.6	4.3	4.1	4.2	4.5
SS3	4.7	4.6	4.5	4.4	4.5	4.6
SS4	4.3	4.4	4.2	4.4	4.5	4.3
SS5	4.2	4.6	4.4	4.2	4.3	4.4
SS6	4.3	4.5	4.1	4.0	4.2	4.3

Dissolved Oxygen (DO): Table-4 shows the variation in dissolved oxygen of underground water. The dissolved oxygen of underground water ranged from a minimum of 4.0 mg/l and maximum of 4.9 mg/l respectively in sampling station SS1 and SS2 respectively.

Table-4:- DISSOLVE OXYGEN value observation during six month at various sampling sites:

	OCT	NOV	DEC	JAN	FEB	MAR
SS1	4.0	4.1	4.1	4.2	4.1	4.2
SS2	4.6	4.8	4.4	4.6	4.9	4.6
SS3	4.5	4.4	4.8	4.5	4.6	4.8
SS4	4.8	4.7	4.8	4.8	4.7	4.7
SS5	4.1	4.5	4.0	4.2	4.4	4.2
SS6	4.2	4.4	4.5	4.3	4.4	4.1

Total Dissolved Solid (TDS): The total dissolved solids of underground water ranged from a minimum of 325 mg/lit to a maximum of 380 mg/lit of SS1 and SS2 respectively (Table-5). In water, total dissolved solids are composed mainly of carbonates, bicarbonates, chlorides, phosphates and nitrates of calcium, magnesium, sodium, potassium and manganese, organic matter, salt and other particles.

Table-5:- TOTAL DISSOLVED SOLIDS value observation during two seasons at various sampling sites:

	OCT	NOV	DEC	JAN	FEB	MAR
SS1	350	355	325	340	345	369
SS2	380	368	375	355	361	357
SS3	345	321	330	335	340	345
SS4	333	338	332	337	334	336
SS5	341	330	334	338	344	335
SS6	355	348	347	350	360	352

Total hardness: Hardness is the property of water which prevents the lather formation with soap and increases the boiling points of water. The Total Hardness of underground water ranged from a minimum of 111 mg/lit to a maximum of 144 mg/lit of SS5 and SS6 respectively (Table-6). The hardness of water depends on the minerals present in the earth crust. This hardness depends on the calcium and magnesium ions present in the underground water.

Similarly, Table-7 and Table-8 show the variations in Calcium and Magnesium Hardness at various sampling sites, respectively. Calcium hardness of underground water ranged from a minimum of 64mg/l to the maximum of 75 mg/l at SS5 and SS3 respectively. Similarly the Magnesium hardness was ranged from 24 mg/l to 30 mg/l which was observed at SS5 and SS6.

Table-6:- TOTAL HARDNESS value observation during six month at various sampling sites:

	OCT	NOV	DEC	JAN	FEB	MAR
SS1	132	137	130	139	138	135
SS2	115	117	119	116	119	127
SS3	134	137	143	135	127	135
SS4	120	125	117	121	121	126
SS5	111	116	116	117	122	119
SS6	136	144	131	141	129	134

Table: 7:- CALCIUM HARDNESS value observation during six month at various sampling sites:

	OCT	NOV	DEC	JAN	FEB	MAR
SS1	66	70	71	73	71	71
SS2	67	69	72	69	69	73
SS3	66	68	70	71	71	75
SS4	65	65	72	67	67	69
SS5	67	64	72	74	74	74
SS6	68	66	64	66	69	70

Table: 8:- MAGNESIUM HARDNESS value observation during six month at various sampling sites:

	OCT	NOV	DEC	JAN	FEB	MAR
SS1	25	26	26	25	27	26
SS2	27	26	25	27	28	28
SS3	26	27	28	29	29	27
SS4	28	27	26	28	27	27
SS5	24	24	26	25	25	26
SS6	27	27	27	28	28	30

4) CONCLUSION

On the basis of this study, the current status of ground water quality is within the permissible limit of standards given by Bureau of Indian Standards (BIS) for drinking water quality and can be used for various household purposes.

Acknowledgement

I am very thankful to Department of Environmental Science, Bareilly College, Bareilly, U.P. for providing me facilities for above study smoothly.

REFERENCES

1) Ali, S. and Ripley, S.D.1995. A Pictorial Guide to the Birds of the Indian Subcontinent. (Bombay Natural history society, Mumbai)
2) Apte, D. 1998. The Book of Indian Shells. (Bombay Natural History Society and Oxford University Press, Mumbai)
3) Ali, S. (13th Eds.) 2002. The Book of Indian Birds. (Bombay Natural History Society and Oxford University Press, Mumbai)
4) Brinson Mark, M. and Malvárez Ana, I. 2002. Temperate freshwater wetlands: types, status and threats. Environmental Conservation, 29(2), 115-133.
5) Balmer, E. 2007. A Pictorial Guide to Butterflies and Moth. (Paragon Books Ltd. New York)
6) Balapure *et al.*, 2012. Avian diversity in Barna wetland of Narmada basin in central India. Journal of Research in Biology, 2 (5), 460-468.
7) Chandra, K., Kushwaha, S., Sambath, S. and Biswas, B. 2012. Distribution and Diversity of Hemiptera Fauna of Verangana Durgavati Wildlife Sanctuary, Damoh, Madhya Pradesh (India). Biological Forum – An International Journal, 4, (1): 68-74.
8) Daniel, J. C. 2002. The Book of Indian Reptiles and Amphibians. (Oxford University Press Walton Street, Oxford)
9) Daniels Ranjit, R. J. (Eds.) 2002. Freshwater Fishes of Peninsular India. (University Press (India) Private Limited, Hyderabad)
10) Daniels Ranjit, R. J. 2005. Amphibian of Peninsular India. (University Press (India) Private Limited, Hyderabad)
11) Dua Anish and Chander Prakash. 2009. Distribution and abundance of fish populations in Harrike wetland – A, Ramsar site in India. J. Environ. Biol., 30(2), 247-251.
12) Deshkar, S., Rathod, J. and Padate G. 2010. Avifaunal Diversity and Water Quality Analysis of an Inland Wetland. Journal of Wetlands Ecology**, (**4), 1-32.
13) Gururaja, K. V. 2010. Pictorial Guide to Frogs and Toads of Western Ghats. (Gubbi Labs LLP)
14) Grimmett, R., Inskipp, C., and Inskipp, T. 2011. Birds of the Indian Subcontinent. (London: Oxford University Press)
15) Gucel, S., Kadis, C., Ozden, O., Charalambidou, I., Linstead, C., Fuller, W., Kounnamas, C. and Ozturk, M. 2012. Assessment of Biodiversity differences between natural and artificial wetlands in Cyprus. Pak.J.Bot., (44)**,** 213-224.
16) Hussain, S.A., K.K. Mohapatra and Ali, S. 1984. Avifaunal profile of Chilka lake, a case for conservation. J. Bomb. Nat. Hist. Soc., Bombay, Technical report-4.
17) Heda, N.K. 2009. Freshwater Fishes of Central India- A Field Guide. (2009). (Vigyan Prasar, Department of Science and Technology, Government of India, Noida)
18) Jha, K.K. 2013. Aquatic Food Plants and their Consumer Birds at Sandi Bird Sanctuary, Hardoi, Northern India. Asian Journal of Conservation Biology, 2 (1), 30–43.
19) Kehimkar, I. (2008). The Book of Indian Butterflies. (BNHS & Oxford University Press)
20) Kanaujia, A. and Kumar, A. 2013.Amphibians of Uttar Pradesh and Their Ecological Importance.(Paper presented in National Conference on Water and Biodiversity on occasion of International Day for Biological diversity, 148-157)
21) Kumar, A. and Srivastava, M. 2013.The Biodiversity at Sandi Bird Sanctuary, Hardoi with special reference to Migratory Birds. Oct. Jour. Env. Res, 1(3), 187-196.
22) Mitsch, W.J. and Gossilink, J.G.1986. The value of wetlands: importance of scale and landscape setting. Elsevier- Ecological Economics, 35 (200), 25–33.
23) Menon, V. 2003. A Field Guide to Indian Mammals. (Penguin India, New Delhi)
24) Meshram, P.K. 2010. Diversity of some fauna in National Chambal Sanctuary in Madhya Pradesh, India. Biodiversitas, 11(4), 211-215.
25) Nameer, P.O., Nair, Resmi R., Anoop, K.R., Nair, S.G., Lekshmiand, R. and Radhakrishnan, P. 2000. Birds of Kerala Agricultural University Campus, Thrissur. Zoos' Print J. 15(4), 243-246.
26) Oliver, A. P. H. 2004. Guide to Seashells of the World. (Firefly Books, Limited)
27) Roberts, T. J. 1997. The Mammals of Pakistan. (Oxford University Press, Karachi)
28) Subba Rao, N.V. (Eds.) 1993. A hand book on freshwater molluscs of India. (John Wailey publn. New York)
29) Stuntz, S., Christian, Z., Ulrich, S. and Gerhard, Z. 2002. Diversity and structure of the arthropod fauna within three canopy epiphyte species in central Panama. Journal of Tropical Ecology, 18,161–176.
30) Srivastava, G. 2007. Fishes of U.P. and Bihar. (Vishwavidyalaya Prakashan)
31) Sebastian, P. A. and Peter, K. V. 2009. Spider of India. (University Press)
32) Singh, S.K., Srivastava, S.P., Tandon, P. and Azad, B.S. 2009. Faunal diversity during rainy season in reclaimed sodic land of Uttar Pradesh, India. Journal of Environmental Biology, 30(4), 551-556.
33) Subramanian, K.A. 2009. Dragonflies of India-A field guide. (Vigyan Prasar, Department of Science and Technology, Govt. of India)
34) Shukla, U.N. and Lone, A.A. 2010. Water Birds of Sur Sarovar Bird Sanctuary Agra, Uttar Pradesh. Research Journal of Agricultural Sciences, 1(2), 135-139.
35) Singh, A.P. 2010. Butterflies of India. (Om Books International)
36) Sivaperuman, C. and Jayson, E.A. 2010. Community Ecology of Tropical Birds. (New-India Publishing House, New Delhi)
37) Talmale, S.S., Limje, M.E. and Sambath, S. 2012. Avian diversity of Singhori Wildlife Sanctuary, Raisen District,

Madhya Pradesh. Biological Forum – An International Journal, 4(2), 52-61.
38) Urfi, A.J., Sen, M. and Megnathan, T. 2005. Counting birds in India: methodologies and trend. Current Science, 89(12), 1997–2003.
39) Whitaker, R., Captain, A. 2008. Snakes of India. The Field Guide. (Chengalpattu, Draco Books)
40) www.forest.up.nic.in (unaao forest department)