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Assessment of the Quality of Ground Water from Melghat Reserve forest villages in India

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Abstract

Various kind of human development is resulting in different kind of pollution to the water resources . Monitoring of Drinking water quality and its serious analysis is very significant relative to access the human health hazards. This paper is an attempt for the same purpose. The sample were collected from villages of Melghat Reserve forest and were analyzed for the desired physiochemical parameters applying the internationally valid standard methods. Results were compared with the international standards. It was found that drinking water quality is very good.

Introduction

Melghat was declared a Tiger Reserve and was among the first nine Tiger Reserves notified in 1973-74 under the Project Tiger. It is located at 21°26′45″N 77°11′50″ECoordinates: 21°26′45″N 77°11′50″E in northern part of Amravati District of Maharashtra State in India. The Tapti River and the Gawilgadh ridge of the Satpura Range form the boundaries of the Reserve. In 1985 Melghat Wildlife Sanctuary was created. The Tapi river flows through the northern end of the Melghat Tiger Reserve, through a forest which lies within the catchment area of the river system. Many different kinds of wildlife, both flora and fauna, are found here. Gugamal National Park, which forms the core area of the Reserve, has an area of 361.28 km^2. carved out in 1987.At the northern extreme of the Amravati district of Maharashtra, on the border of Madhya Pradesh, lies the Melghat in the South-western Satpura mountain ranges. Melghat means 'meeting of the ghats', which describes the area as a large tract of unending hills and ravines scarred by jagged cliffs and steep climbs. The Melghat area was declared a Tiger Reserve in 1974. Presently, the total area of the Reserve is around 1677 km^2. There are no villages in the core area. The forest is tropical dry deciduous in nature, dominated by teak (Tectona grandis). The Reserve is a catchment area for five major rivers: the Khandu, Khapra, Sipna, Gadga and Dolar, all of which are tributaries of the river Tapti. The main fauna found here are tiger, leopard, sloth bear, wild dog, jackal, sambar, gaur, barking deer, nilgai, chital, chausingha, ratel, flying squirrel, wild boar, langur, Rhesus monkey, porcupine, pangolin, mouse deer, python, otter and blacknaped hare. here are 61 villages in the Reserve, all outside the core area. 22 are in the buffer zone and 39 in the Multiple Use Area (MUA).

Human population in the buffer zone and MUA is 11024 and 15642, respectively, as per 1994 census. The entire forest and people along with animals are depended on Tapi river, streams and some Ponds. The study was focused on ground water of Melghat villages.

Image.1 Water pool in the middle of forest

Image.2 Melghat Reserve forest map

Experimental

Drinking water samples of different locations at Melghat area was collected and studied during the period from may 2013 to January 2014. All the chemicals used were of AR grade Merck Brand. The list of used Equipments and their make for our research study was given in Table.1 The Maps are taken from Google Maps, The Longitude and Latitude values are noted with Explorist-200 gps. The methods are listed in Table.2. For the present study water samples are collected from semadoh, Bori,chitri, Harisal, Kadhava, Talai, From each village 6 samples were collected.

S.NO	Instrument	Make and Model number
1	pH Meter	Helico
2	Electrical Conductivity Meter	Helico
3	U.V-Visible Spectrophotometer	Tech comp, 2301,Hitachi software
4	Ion Selective Electrode Meter	Helico
5	Atomic Absorption Spectrometer	LABINDIAAA-7000
6	Electrical Balance	Denver-A200DS
7	Flame photometer	Electronics India- 1385

Table.1 List Equipments and their Brands

S.No	Test Parameter(s)	Test Method
1	pH	4500. H^+B
2	Color	2120. B
3	Odor	2150. B
4	Electrical Conductivity	2510-B
5	Total Dissolved Solids at 180ºC	2540. C
6	Total Suspended Solids at 105^0C	2540 D
7	Turbidity	2130. B
8	Total Hardness as $CaCO_3$	2340. C
9	Calcium as Ca	3500. Ca.B
10	Magnesium as Mg	3500. Mg.B
11	Total Alkalinity as $CaCO_3$	2320. B
12	Chlorides as Cl^-	4500. Cl^-.B
13	Sulphates as SO_4	4500. SO_4^{2-}.E
14	Chemical Oxygen Demand	5220. B
15	Biochemical Oxygen Demand	IS: 3025

S.No	Test Parameter(s)	Test Method
16	Dissolved Oxygen	4500. O.C
17	Fluoride as F^-	4500. F^-.C
18	Nitrates as NO_3^-	4500. NO_3^-.B
19	Ammonical Nitrogen as N	4500-NH_3 –C
20	Sodium as Na	3500-Na.B
21	Potassium as K	3500-K.B
22	Iron as Fe	APHA 3111B/3030E
23	Manganese as Mn	APHA 3111B/3030E
24	Copper as Cu	APHA 3111B/3030E
25	Zinc as Zn	APHA 3111B/3030E

Table.2 List of Parameters and methods

Results and discussion

The results of present study was given in Table.3. The results were compared with IS:10500:2012 standard parameters.

S.No	Test Parameter(s)	Unit	Requirement acceptable Limit as per IS:10500: 2012	Permissible Limit in the absence of Alternative source as per IS 10500:2012	Summer	Monsoon	Winter
1	pH	--	6.5 to 8.5	No relaxation	7.2	7.4	7.1
2	Color	Pt.Co	5	15	<4	<4	<4
3	Odor	TON	Agreeable	Agreeable	No Odor is observed	No Odor is observed	No Odor is observed
4	Electrical Conductivity	µmos/cm			1540	1320	1456
5	Total Dissolved Solids at 180ºC	mg/L	500	2000	745	650	690
6	Total Suspended Solids at 105^0C	mg/L			4.5	4.1	4.3
7	Turbidity	NTU	1	5	0.11	0.11	0.10
8	Total Hardness as $CaCO_3$	mg/L	200	600	440	390	420
9	Calcium as Ca	mg/L	75	200	115	90	120
10	Magnesium as Mg	mg/L	30	100	35	29	30
11	Total Alkalinity as $CaCO_3$	mg/L	200	600	450	390	420
12	Chlorides as Cl^-	mg/L	250	1000	419	390	402
13	Sulphates as SO_4	mg/L	200	400	290	315	305
14	Chemical Oxygen Demand	mg/L	-	-	19.5	20.42	21.47
15	Biochemical Oxygen Demand	mg/L	-	-	7	7	7
16	Dissolved Oxygen	mg/L			3.9	4.1	4.0
17	Fluoride as F^-	mg/L	1	1.5	0.9	1.0	1.0
18	Nitrates as NO_3^-	mg/L	45	No relaxation	38	42	40

S.No	Test Parameter(s)	Unit	Requirement acceptable Limit as per IS:10500: 2012	Permissible Limit in the absence of Alternative source as per IS 10500:2012	Summer	Monsoon	Winter
19	Ammonical Nitrogen as N	mg/L			BDL	BDL	BDL
20	Sodium as Na	mg/L			84	95	88
21	Potassium as K	mg/L			4	5	3
22	Iron as Fe	mg/L	0.3	No relaxation	0.3	0.2	0.31
23	Manganese as Mn	mg/L	0.1	0.3	0.1	0.11	0.1
24	Copper as Cu	mg/L	0.05	1.5	0.05	BDL	0.05
25	Zinc as Zn	mg/L	5	15	0.55	0.34	0.39

Table.3 Results of water analysis of Melghat forest villages

Total 36 no. of water samples were analyzed in this total study in three seasons (Summer, Monsoon, Winter). PH was find to be in the range of 7.1 to 7.4 Normal alkalinity results tells about that Carbonates, and Bi carbonates are with in the limit. All the sample chemical were found to be within the prescribed limit of the WHO. Total Hardness of water depends upon the amount of calcium and magnesium and other ions. DO value in the studied area varied between 2.1-5.2 mg/L. 09 sampling points showed higher DO values than the prescribed limit by WHO. High amount of DO imparts good palatability to water. BOD value in the studied area varied between 3.9-4.0 mg/L. All sampling points showed BOD values within the limit prescribed by WHO.

Conclusion

According to WHO, nearly 80% of all the diseases in human beings are caused by water. The water quality parameters of the various areas of Melghat reserve forest area, Maharashtra, India indicates that the drinking water samples are fit on the standard parameters and the quality is good for drinking purpose. Drinking water pollution in the studied area is nil because of controlling guidance of Local government proper environment management plan and WRCS (Wild life research conservation Society) schemes and support to the local people.

References

1. APHA . Standard methods for the examination of water and waste water (19th ed) (1996).
2. Nagarajan S, Swaminathan M and Sabarathinam PL, "Standard Methods for the Examination of Water and Wastewater" *Poll. Res.,* 12(4): 245 (1993). Washington, DC: Public Health Association.
3. Ahmed, A.M.(2004). Ecological studies of the river Padma at Mawa Ghat, Munshiganj. I. Physico-chemical Properties. Pakistan Journal of Biological Sciences. 7(11):1865-1869.
4. M. Hussain, T.V.D.P. Rao, H.A. Khan and M. Satyanarayan. "Chemical Properties of Drinking Water of Some Villages in Sangamner Tahasil, Dist- Ahmednagar, Maharashtra, India and its Impact on Human Health" , *Orient. J. Chem.,* 27(4): 1679-1684 (2011).
5. Roy,H.K.(1955). Plankton ecology of river Hoogly in Patna, West Bengal. Ecology. (36):169-175.
6. Malviya, S.K. Diwakar and S.O.N. Choubey. "Chemical assessment of narmada river water at Hoshangabad city and Nemawar as navel of river in Central India" ' *Orient. J. Chem*. 26(1): 319-323 (2010).
7. Schaefer, S. C ; Alber, M. (2007) . Temporal and spatial trends in nitrogen and phosphorusinputs to the watershed of the Altamaha River,Georgia,USA.Biogeochemistry.(86):231-249.

8. Trivedy R K and Goel P K, "Chemical and Biological Methods for Water Pollution Studies", Environmental Publications, Karad, 7 (1986).
9. Stickney, R.R.(2005).Aquaculture. An Introductory Text.CABI Publishing, UK.p265.
10. Sverdrup, H.H; Johnson, M.W ; Fleming, R.H.1942). The Oceans: Their physics,chemistry and general biology. Prentice Hall,New York.
11. Surve P R, Ambore N E and Pulle J S, "Ground Water Quality of Gandhinagar Taluka, Gujarat, India" Eco.Env. and Consv., 8(1): 87-90 (2005).
12. M.G. Adak, and K.M. Purohit, "Chemical Properties of Drinking Water of Some Villages in Sangamner Tahasil, Dist-Ahmednagar, Maharashtra, India and its Impact on Human Health" *Poll. Res*., 20: 575 (2001).
13. Talling, J.F.(1957). The longitudinal succession of the water characteristics in White Nile. Hydrobiologia.(90):73-89.
14. Taylor, E.W. (1949). The examination of water and water supplies. J.and A Churchill Ltd, London.
15. Wetzel, R.G; Likens, G.E. (2006). Limnological analysis.3rd ed. Springer-Verlag, New York,391.
16. APHA, "Standard methods for the examination of water and wastewater", American Public Health Association, Washington D.C.,(1998).
17. K.Uma maheswarasarma et al,, hydro-chemical parameters of ground water around lime mines in Pidiuguralla. Guntur district, Andhra Pradesh. The Experiment, Feb.2013 Vol..7 (1) ,385-387