GLOBAL JOURNAL OF MULTIDISCIPLINARY STUDIES UGC APPROVED ISSN: - 2348-0459
www.gjms.co.in

Volume-6, Issue-7, June 2017 Impact Factor: 3.987

Paper ID: UGC 48846-838

PHYSICO-CHEMICAL ANALYSIS OF GROUND WATER AND SURFACE WATER IN GWALIOR REGION (M.P.) INDIA

S. Manderia*
*Assistant Professor, School of Studies in Botany,
Jiwaji University, Gwalior (M.P.) India 474011

M.Nasir War
Research Scholar, School of Studies in Botany, Jiwaji University, Gwalior (M.P.) India 474011

Abstract: Water is essential to good health and economic progress, yet its provision to most urban residents in the developing world is still an unattainable goal. Indiscriminate exploitation of ground water for agricultural and industrial purpose has further aggravated the situation, affecting the quality and quantity of ground water. In Gwalior city the scarcity of drinking water occurred mostly in every summer. Due to excessive dose of iron, manganese, chloride, sulphates, total dissolved solids, hardness, alkalinity or acidity. Physico-chemical parameters of ground water of municipal area of Gwalior city was carried out seasonally to study the quality of water and suitability for domestic purpose. Water samples from different sources at different locations were collected in different seasons. Following parameters were monitored & analysed by APHA (pH, Electric conductivity, TDS, Turbidity, Total hardness and Content of Fluoride, Sulphate, Chloride etc.) and results were compared with the standard values prescribed by WHO and APHA. The present investigation revealed that the quality of water of a source varies from season to season and some of the water samples are unfit for drinking and utility purpose. The status of drinking water in selected sampling sites is worst, distorted ecological equilibrium and urgent requirement to emphasize an eco-friendly technique. The main aim of this study is to assess the ground water and surface water quality status of selected sites of Gwalior region.

Key Words: Drinking water, Physico-chemical characteristics, Portability, Distorted, ecofriendly technique.

Introduction

Ground water has been considered to be so safe & pure to drink without any treatment. So many water companies deliver it untreated to their customer. At this moment, urban residents are at great risk for without safe water and lack adequate sanitation facilities for life, health and happiness. But our Gwalior city aquifers are becoming contaminated with hazardous substances from landfills, surface components and septic system, agricultural practices, hazardous waste of factories deliberately injecting untreated effluent directly into ground. Water is contaminated when it contains parasitic agents, poisonous chemical substances and industrial or domestic wastes (Annouara et al., 2004).

This invoked to choose the problem in context of the decreasing level of ground water and to help the people by having this project based on an eco-friendly technology which will help in increasing water level and make an assessment of it. Gwalior city with an average annual rain fall of 910mm is a city located in an area that suffers critically from a shortage of water resources. So the conservation of improvised water resources is indispensable for the sustainability of our economic development. For this reason, in the past few decades more attention has been given to the water quality of Gwalior city. Many people from the city are suffering from health problems due to consumption of the available contaminated water.

Analysis physico-chemical parameters of ground water of municipal area of Gwalior city was carried out seasonally to study the quality of water and suitability for domestic purpose.

Water samples from different sources at different locations were collected in different seasons. The parameters: pH, EC, TDS, Turbidity, Total hardness and content of Fluoride, Sulphate, Chloride were studied and compared with the standard values prescribed by WHO and APHA. The present investigation revealed that the quality of water of a source varies from season to season and some of the water samples are unfit for drinking and utility purpose.

Ground water sampling stations:

Morar (G1): Morar zone lies in north-east part of the Gwalior city. Groundwater is supplied through tube wells to this zone with 189 tube wells in this zone. Some consumers receive water from both tube well as well as Moti Jheel supply.

Gole ka Mandir (G2): Gole ka Mandir is one of the important circles of Gwalior which connect the city to many of the important national highways. The name comes from an actual Temple (Gole ka Mandir) which is situated nearby. Mostly ground water is supplied in this zone.

Railway Station (G3): Gwalior is a major railway junction in northern central region. Gwalior is one of the few places where both narrow gauge and broad gauge railways tracks are still operational. Gwalior Junction is a five railway track intersection point.

Shinde ki Chwani (G4): It is located in center of Gwalior city at 26.21 latitude and 78.26 longitude.

Kampoo (G5): It lies in the south-east of the Gwalior city at 26.21 latitude and 78.18 longitude.

Govindpuri (G6): It is mainly a residential area in Gwalior city located at 26.19 latitude and 78.12 longitude.

Surface water sampling stations:

Tighra Dam: It is located on the outskirts of the city. Tighra dam is being used to store water from the Sank river and supply water to the whole of the city. There is boating as well as adventure sports' facilities by M.P. Government. Two samples (**S1** and **S2**) were randomly collected from this sampling station.

Moti jheel: It lies in the north-west of the Gwalior city. Moti Jheel receives its water supply from Tighra reservoir. Treated water is supplied to the people of Gwalior from both old and new treatment plants. Two samples (**S3** and **S4**) were randomly collected from this sampling station.

The various physico-chemical parameters were followed by standard methods as given in APHA (1992) and Adoni (1985). The various parameters taken into consideration during present study were temperature, pH, Electrical conductivity, Total Dissolved Solids, Total Hardness, Calcium Hardness, Magnesium Hardness, Total Alkalinity, Total Acidity Chloride, Nitrate, Nitrite, Chromium (Hexavalent) and Lead.

Parihar et al. (2012) studied the physico-chemical and microbiological characteristics of the drinking water from different location in Gwalior region. Results depicted that electrical conductivity, total dissolved solids, total aerobic microbial count and most probable number were maximum in S-3 sample where as pH, hardness and DO higher in S-6, S-8, S-10 samples. assessed and compared with the Indian standards.

Parameters like temperature, EC, TDS, pH, total alkalinity, total acidity, total hardness, calcium hardness, magnesium hardness, chloride, nitrate, nitrite and heavy metals like chromium (hexavalent) and lead were estimated. The temperature varies from 27°C to 33°C in all sampling stations. Electric conductance in all the surface water samples ranges between 270-290 µmhos/cm while in ground water minimum 190µmhos/cm at G5 sites while 875µmhos/cm at G2 sites. Total dissolved solids are minimum in surface water i.e. 57 to 59ppm while maximum at G1

(430ppm) & G2 (563ppm) sites. The groundwater is neutral to basic in nature pH ranges b/w 7 to 8.7 while surface water is slightly basic 7.1 to 7.6 in all water samples.

The results depicted that total hardness was maximum G3 i.e. 530mg/lit exceed the standard limit of WHO while minimum 190 mg/lit at S1. It makes water hard and hence affects the portability of drinking water. Magnesium (Mg^{2+}) and calcium (Ca^{2+}) are the main cations responsible for the hardness of water. The higher concentration of Ca^{2+} and Mg^{2+} could be due to the deposits of the salts of these elements into soil, which may have leached into ground water. Total hardness observed in all samples of groundwater fall under hard to very hard category while surface water under prescribe limits.

Total alkalinity in all the water samples analysed was under the standard limit whereas acidity slightly more in all the samples. Minimum alkalinity 80mg/lit and maximum 210mg/lit at S2 & G2 sites respectively where as acidity 36mg/lit at S1 & 240mg/lit at G1 & G2 . Chloride content minimum 16mg/lit at G1 and maximum 26mg/lit at G2 & S1 indicate low level of chloride content in all waster sample. Nitrate content ranges b/w 0.7 to 2.4 mg/lit in ground water samples and 6.7 to 7.8mg/lit in surface water samples respectively while nitrite content ranges b/w 0.05 to 1.4 mg/lit in G4 & S2 sites. Cr & Pb are not detectable are very less in all water samples. The physiochemical parameters results were compared with the Indian Standards to know the suitability of water for drinking.

Various study were carried out on the ground water quality and correlation coefficients calculated like Devi and Premkumar (2012) impacts of industrial activities in & around SIPCOT Industrial complex in Cuddalore District; Ashfaq and Ahmad (2014) Aligarh city, Bhade and Khadsan (2014) Sangrampur Tehsil; Pathak (2012) Sagar city; Bano and Ahmad (2014) Firozabad city. Parihar et al. (2012) Gwalior region assessed for their suitability for human consumption.

The present investigation suggest that water of Gwalior region is safe for drinking purpose and needs to be assessed lowered down within prescribed limits before using it for drinking purposes. In general ground water quality of Gwalior region is not harmful to human beings. So the ground water and surface water of this study area satisfy the requirement for the use in various purposes.

References

Adoni AD (1985). Workbook on limnology,

Ahmad Ashfaq and Faizan Ahmad (2014). Evaluation of Ground Water Quality of Aligarh city, India. Int. J. Curr. Res. Aca. Rev..2(8): 304-308.

Amaaliya N.K. and Sugirtha P. Kumar (2013). Carried out ground water quality status by water quality index method at Kanyakumari (INDIA).

APHA: Standard methods for the examination of water and wastewater. American Public Health Association, 20th Edn. DC, New York 1998.

B.I.S. Bureau of Indian Standards Drinking water specification, Ist revision, ISS 10500, 1991

Bureau of Indian Standards for Drinking water 2012 (BIS 2012), .

Cristina Rosu, Ioana Pistea, Mihaela Calugar, Ildika Martonos, A. Ozunu (2012). Assessment of Ground Water Quality Status by using water quality index (WQI) Method in Tureni Village.

D. L.Bhade and R.E.Khadsan (2014). Physico-Chemical Analysis of Ground Water in Sangrampur Tehsil of Buldana District, Maharashtra. American International Journal of Research in Formal, Applied & Natural Sciences, 6(1): 70-72.

Devi S. and Premkumar R. (2012). Physicochemical Analysis of Groundwater samples near Industrial Area, Cuddalore District, Tamilnadu, India. International Journal of Chem Tech Research, 4(1): 28-34.

G. Achuthan Nair, Jalal Ahmed Bohjuari, Muftah A. ALMariami, Fathi Ali Atia and Fatma

F. EI-Toumi (2006). Carried out groundwater quality status by water quality index at North – East Libya,oct, 27(4): 695-700.

Guidelines for drinking-water quality. 2nd ed. V.3. Surveillance and control of community supplies. Geneva: World Health Organization, 1997, World Health Organization, 238.

Gupta N. and et.al. (2010). Physico-Chemical Analysis of Drinking Water Quality from 32 locations in Delhi, Journal of Indian Water Works Association.

Hemant Pathak, Deepak Pathak and S. N. Limaye (2012). Studies on the physico-chemical status of two water bodies at Sagar city under anthropogenic Influences. Advances in Applied Science Research, 3(1):31-44.

J. Sirajudeen Arul Manikandan and V. Manivel (2013). Water Quality Index of Ground Water around Ampikapuram area near Uyyakondan channel Tiruchirappalli Tamil Nadu, Archives of Applied Science Research. 5(3): 21-26.

Kavitha, R., and K. Elangovan (2010). Ground water quality characteristics at Erode district, Tamilnadu, India. Int. Journal of Environmental Science, 1(2):145.

Manjesh Kumar and Ramesh Kumar. (2013). Assessment of Physico-Chemical properties of Ground Water in granite mining area in Goramachia, Jhansi (India), 2(1): 19-24.

Manual on water and wastewater analysis (1998). National Environment Engineering Research Institute, Nagpur.

Muthukumaravel K. and et al. (2010). Evaluation of Ground Water Quality in Perambalur, Indian Journal of Environmental Sciences, 14(1): 47-49.

Nikhat Bano, Ateeque Ahmad (2014). Qualitative Analysis of Water Quality through Index Method: A Case Study of Firozabad City (India). International Journal of Science and Research (IJSR). 3(10):1630-1632.

Niranjan K. and et.al. (2011). Ground Water Quality Assessment of Wailpalli Nalgonda, Indian Journal of Environmental Sciences, 15(1): 69-76.

Parihar S.S., Kumar Ajit, Kumar Ajay, Gupta R.N., Pathak Manoj, Shrivastav Archana and Pandey A.C.(2012). Physico-Chemical and Microbiological Analysis of Underground Water in and Around Gwalior City, MP, India. Res. J. Recent Sci., 1(6): 62-65.

Rajankar P. and et al., (2013). Assessment of Ground Water Quality using water quality index(WQI) in Wardha Maharashtra, Journal of Environmental Science and Sustainability, NEERI, 1(2): 49-54.

Ramakrishna C. Mallikarjuna Rao, D., Rao K.S. and Srinivas, N., (2009). Studies on Ground Water Quality in slums of Visakhapatnam, Asian Journal of Chemistry, 21(6): 4246-4250.

S.P. Gorde and M.V. Jadhav. (2013). Assessment of Water Quality Parameters: A Review, Journal of Engineering Research and Applications. 3(6): 2029-2035.

Shivasharanappa Padaki Srinivas, Mallikarjun S Huggi. (2011). Assessment of Ground Water Quality using Water Quality Index, at Bidar City Karnataka. International Journal of Environmental Science. 2(2): 965-976.

Srinivas Kushtagi and Padki Srinivas (2011). Studies on water quality index of ground water of Aland taluka, Gulbarga(INDIA), International Journal of Applied Biology and Pharmaceutical Technology, 2(4):252-256.

Tyagi, S., Sharma, B, Singh, P., Dobhal, R. (2013). Water Quality Assessment in terms of Water Quality Index, American Journal of Water Resources. 1(3): 34-38.

Wabaluti Rambai (2013)., Dissertation Phase-1, Evaluation of water quality index and computation of environmental health indicators-case study, S.G.S.I.T.S. Indore.

Paper ID: UGC 48846-838

Table No.1 Physico-chemical analysis of ground water and surface water samples

Sampling Stations	G1	G2	G3	G4	G5	G6	S1	S2	S3
Temperature (°C)	28	30	27	32	32	28	33	31	30
EC (µmhos/cm)	675	884	875	295	190	574	295	297	270
TDS (ppm)	430	563	188.7	187.6	120.5	172.2	57.8	59.7	57.1
pH	7.2	8.3	8.7	8.3	8	7	7.6	7.4	7.1
Total Hardness	500	480	530	380	280	400	190	200	240
Ca Hardness	310	257	372.5	178.5	105	215	84	76	94.5
Mg Hardness	46.17	54.18	38.27	48.96	42.52	49.81	30.61	28.18	35.35
Total Alkalinity	170	210	130	110	100	150	85	80	170
Total Acidity	242	244	202	68.3	155	198	36.3	80	92
Chloride	16.26	20.77	26.76	19.67	18.01	20.27	26.12	24.02	22.12
Nitrate	1.7	1.1	2.4	0.7	1.3	1.6	7.5	7.8	6.7
Nitrite	0.46	0.20	0.51	0.05	0.12	0.23	0.97	1.4	0.93
Cr (Hexavalent)	0.003	0.002	0.003	0.001	ND*	0.002	0.001	0.002	0.007
Pb	0.003	0.005	0.015	0.002	ND*	0.003	0.001	0.001	0.003

Note: *Except Temperature, EC, TDS and pH all results are expressed in mgl^{-1} *ND= Not Detectable

G1 :Morar G2 :Gole Ka Mandir G3: Railway Station
G4: Shinde Ki Chawni G5: Kampoo G6: Govindpuri