



IJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 Issue: III Month of publication: March 2018

DOI: <http://doi.org/10.22214/ijraset.2018.3491>

www.ijraset.com

Call:  08813907089

E-mail ID: ijraset@gmail.com

Study of Physico-Chemical Characteristics of Groundwater around Kala Nala basin, Ichalkaranji, Kolhapur, Maharashtra, India

A. A. Lole¹, S. S. Bharamgunde², D. B. Bankar³, V. S. Adam⁴, V. L. Bankar⁵, R. R. Devkar⁶
^{1, 2, 3, 4, 5, 6}Department of Civil Engineering, Sanjay Ghodawat group of Institutes, Atigre Maharashtra, India

Abstract: Groundwater is one of the most important natural resource. It is a widely used for drinking in both the rural and urban areas. The groundwater quality, however in recent time has got deteriorated due to the percolation of polluted water in to the soils from the wastewater drains, polluted river sand ponds. The present study reveals the groundwater quality of Kala Nala basin in the Ichalkaranji, Kolhapur. In that, The Piper Trilinear diagram the chemical quality of dug well, bore well and surface water samples of Kala Nala basin, reveals that, 25% samples of pre and post-monsoon seasons represent $HCO_3 + CO_3$ type, 41.67% $Ca(Mg)HCO_3$ type and 33.33% $Na(K)HCO_3$ type of hydro chemical facies. Based on U.S. Salinity diagram groundwater samples of post-monsoon season and pre-monsoon season, 25% samples are fall in C4 – S3 field, 75% samples are in C4 – S2 field and 25% samples are fall in C4 – S3 field, 25% samples are in C4 – S2 and 50% samples are fall in C3 – S2 field respectively. The water sample shows result of medium to very high salinity hence water is unsuitable for irrigation purpose. The Gibbs variation diagrams of pre and post-monsoon seasons suggest the chemistry of groundwater is controlled by precipitation dominance

Keywords: Groundwater quality, Social Awareness.

I. INTRODUCTION

Groundwater is one of the prime sources of fresh water. It is an important source of drinking water for the Water pollution is increasing steadily due to rapid population growth, industrial proliferations, urbanize Ground water contamination is generally irreversible i.e. once it is contaminated; it is difficult to restore the original water quality of the aquifer. Excessive mineralization of groundwater degrades its quality and produces an objectionable taste, odour and excessive hardness. Although the soil mantle through which water passes acts as an adsorbent retaining a large part of colloidal and soluble ions with its cation exchange capacity, but ground water is not completely free from the menace of chronic pollution. Therefore, it is always better to protect ground water in the first place rather than relying on technology to clean up contaminated water at a later stage. India is developing country which means infrastructure sector is growing on at a much higher rate, leads to the development of core industries like metals, chemicals, fertilizers, drugs and petroleum etc. and other industries such as plastics, pesticides, detergents, solvents, paints, dyes, and food disposed their effluents and emissions on land and water bodies and polluting our environment.

II. STUDY AREA

The study area is bounded between latitude N 16.685 to N 16.672 & N 16.757 to N 16.663 and longitude E 74.458 to E 74.491 & E 74.478 to E 74.483, in Survey of India Toposheet numbers 47 L/6, on scale 1:50000. The area is covered by Deccan trap of Upper Cretaceous to Lower Eocene in age. The main source of water for drinking, irrigation and industrial purposes is from dug wells, bore wells and surface water.

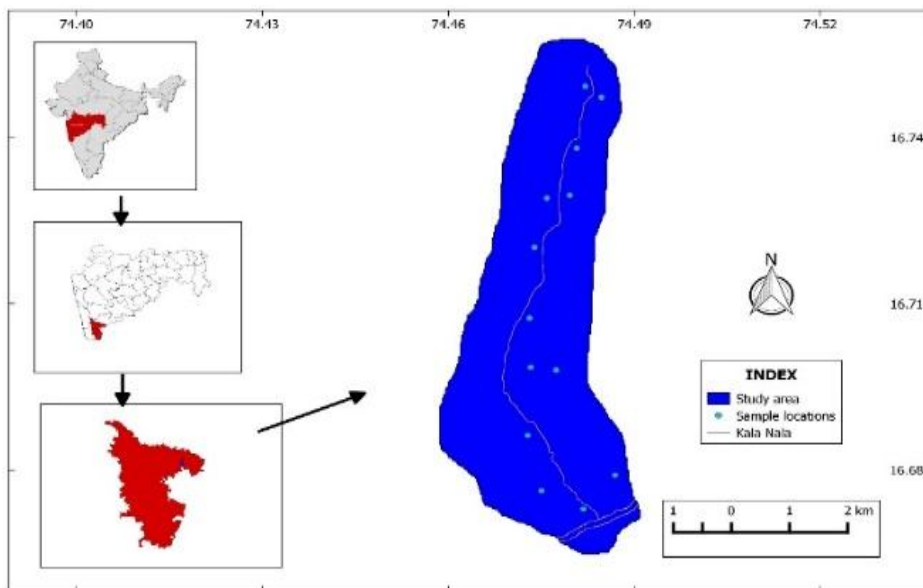


Fig.1: Study Area with sample locations

III. METHODOLOGY

For the appraising of groundwater quality, representative 25 water samples were collected in pre-monsoon and post monsoon seasons. The samples were collected in one-liter plastic bottles. The various physio -chemical parameters were analysed by following the standard procedures given in standard methods for the examination of water and waste water (APHA, AWWA, WPCF [2]; Trivedy and Goel[13]) Table No. 1 and 2. Concentration of different chemical parameters of dug well, bore well and surface water samples are shown in table no. I & II.

TABLE I: Concentration of different chemical parameters of water samples of study area (Post-monsoon)

SAMPLE NO	PH	EC μ s/cm	THmg/lit	TAmg/lit	TDSmg/lit	Ca	Mg	Na	K	CO ₃	HCO ₃	SO ₄	CL
SW-01	9.80	1893	14.4	390	15.63	112.22	60.91	221.58	18.59	0	400	151.52	8.9
SW-02	8.50	2128	8.9	480	17.37	88.17	36.54	303.22	19.06	0	510	75.76	9.7
SW-03	9.75	1478	23	330	12.2	87.18	35.04	218.25	5.75	0	480	91.12	22
SW-04	10.20	1800	20.5	300	14.86	100.2	104.76	163.27	3.43	0	490	121.21	10.6
SW-05	9.60	2200	35.1	340	18.17	64.128	29.23	198.26	16.88	0	350	136.36	8.3
SW-06	10.80	1801	24.3	370	15.4	200.4	104.76	198.26	3.91	0	360	257.58	14.3
DW-01	9.55	1980	16.2	400	16.35	120.26	78.14	220.14	7.18	0	380	220.53	12.5
DW-02	8.80	2004	11.2	340	16.53	88.17	48.72	314.88	0.73	20	420	166.67	8.6
DW-03	9.65	1905	11.3	460	15.73	110.2	55.2	225.3	2.22	0	386	225.23	6.5
BW-01	10.75	1805	14.1	430	14.9	89.25	65.23	169.56	10.23	0	320	198.85	12.5
BW-02	9.70	1637	8.4	350	13.52	114.45	60.52	180.85	6.5	0	396	221.85	9
BW-03	9.40	1695	8.6	370	14	98.52	107.45	219.12	3.6	0	360	222.2	5.4
BW-04	10.30	1991	27.3	398	16.44	86.45	145.2	278.2	7.8	0	410	245.2	11

TABLE III: Concentration of different chemical parameters of water samples of study area (Pre-monsoon)

SAMPLE NO	PH	EC μ s/cm	THmg/lit	TAmg/lit	TDSmg/lit	Ca	Mg	Na	K	CO ₃	HCO ₃	SO ₄	CL
SW-01	8.20	1904	17.3	430	16.43	114.26	62.24	231.27	19.69	0	470	155.2	9.5
SW-02	9.35	2286	9.5	510	19.52	90.42	38.55	307.35	20.4	0	520	77.12	9.9
SW-03	10.20	1582	27	360	13.7	89.2	37.2	220.24	6.85	0	510	92.56	23
SW-04	11.40	1986	21.4	310	15.46	101.52	106.7	165.35	4.33	0	490	123.86	11.7
SW-05	8.75	2375	37.2	380	19.2	66.78	31.2	202.36	17.44	0	360	137.23	9.4
SW-06	11.20	1929	25.4	410	16.6	204.38	106.25	199.46	4.95	0	420	258.4	15.3
DW-01	10.80	2076	18.3	460	17.87	128.45	79.3	223.14	8.28	0	410	239.5	13.8
DW-02	9.60	2069	12.8	380	17.46	90.18	51.6	316.2	0.87	30	430	168.2	9.6
DW-03	10.70	2040	12.4	530	16.68	112.4	57.38	226.8	3.24	0	398	227.82	7.5
BW-01	11.80	1936	15.1	580	15.4	90.4	66.28	170.3	11.32	0	330	199.6	13.6
BW-02	10.20	1782	9.4	480	14.45	116.38	61.49	190.95	8.5	0	410	223.45	10
BW-03	10.50	1784	9.7	430	26	99.54	109.85	220.32	4.7	0	380	223.3	5.7
BW-04	11.85	2095	28.6	490	17.28	89.4	147.27	188.4	8.9	0	430	246.8	12

IV. RESULT & DISCUSSION

From the Fig. 2.a - b, it is observed that 13 water samples (100%) of pre-monsoon and post-monsoon seasons belongs

A. Classification of groundwater based on Piper Trilinear diagram

In order to understand the variation in hydro chemical facies with time and space, the data of chemical analyses of dug on the Piper Trilinear diagram. (Fig.1.a-b) Pipers Trilinear diagrams indicate that, the 25% samples of pre and post-monsoon seasons represent HCO₃ + CO₃ type, 41.67% Ca(Mg)HCO₃ type and 33.33% Na(K)HCO₃ type hydro chemical facies.

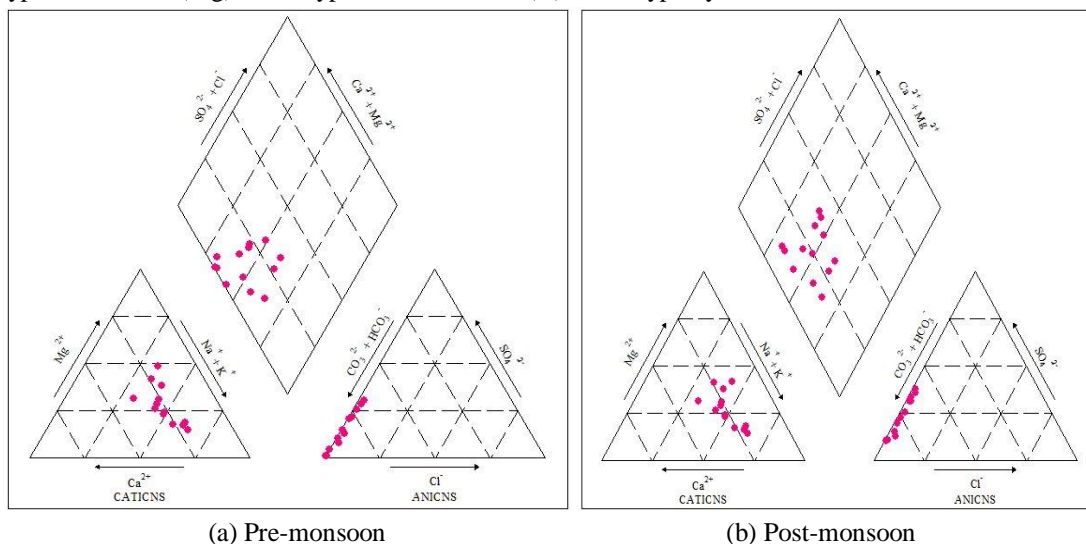
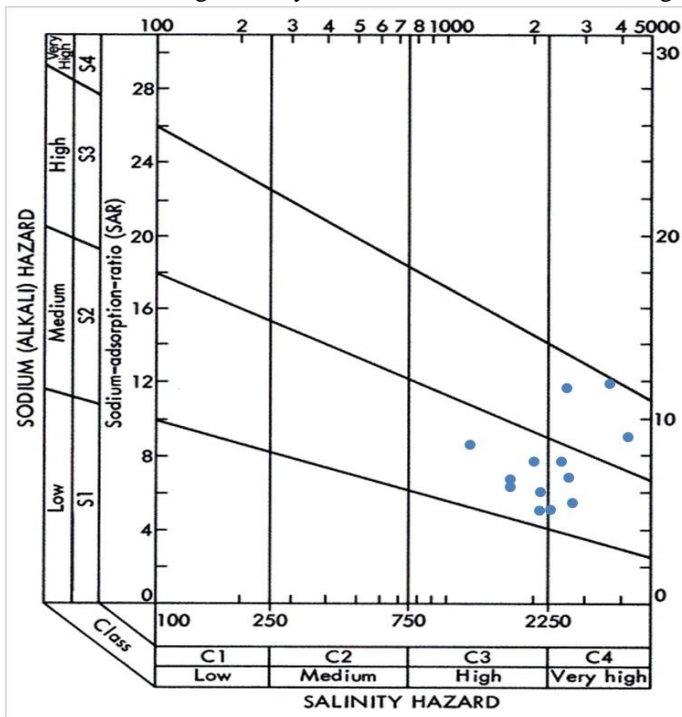


Fig.2.a-b : Piper Trilinear diagram from water samples of the study area

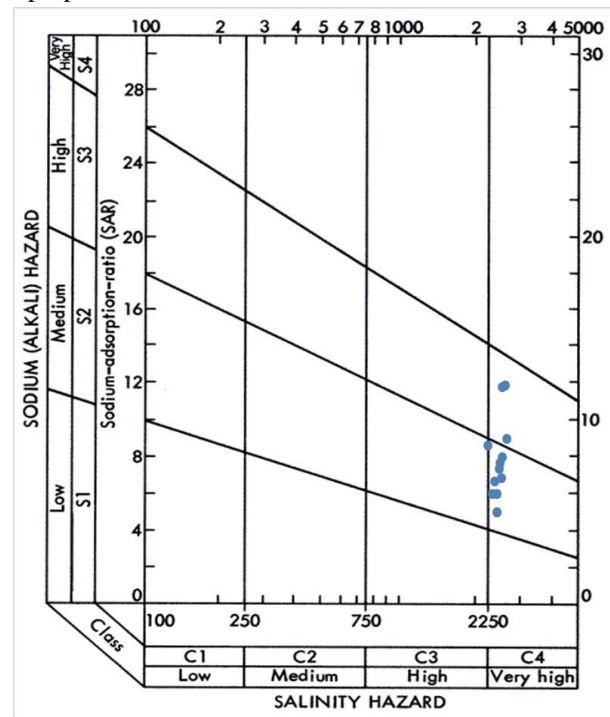
B. Classification of groundwater based on U. S. Salinity diagram

On the basis of U.S. Salinity diagram (Fig.3.a-b) groundwater samples of post-monsoon season 25% samples are fall in C4 – S3 field and 75% samples are in C4 – S2 field. The water sample shows result of high to very high and medium to very high salinity hence water is unsuitable for irrigation purpose.

On the basis of U.S. Salinity diagram groundwater samples of pre-monsoon season 25% samples are fall in C4 – S3 field 25% samples are in C4 – S2 and 50% samples are fall in C3 – S2 field. The water sample shows result of high to very high, high to very high and medium to high salinity hence water is unsuitable for irrigation purpose.



(a) Post-monsoon

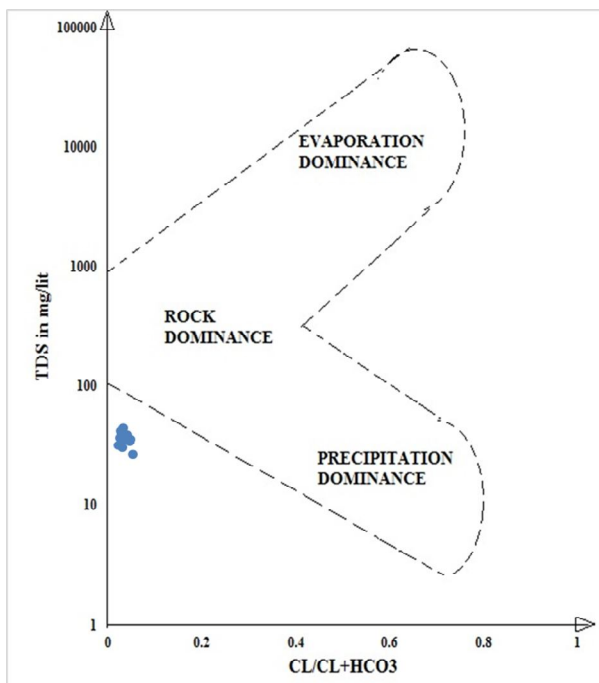


(b) Pre-monsoon

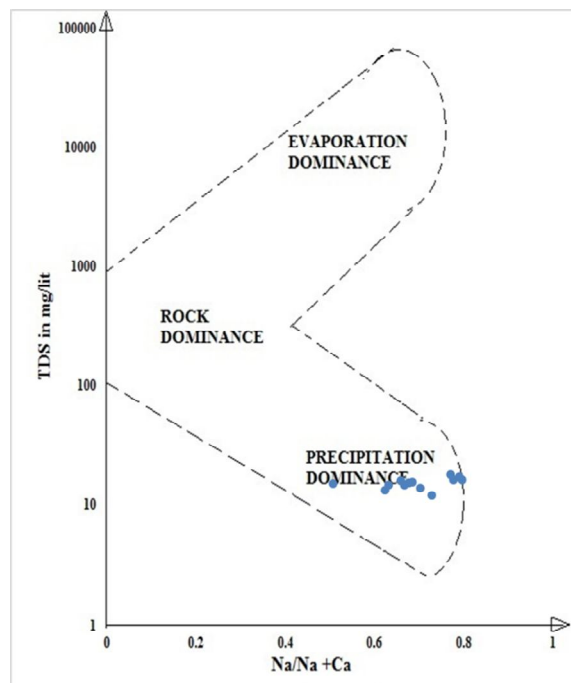
Fig.2.a-b : Classification of irrigation suitability with USSL Diagram

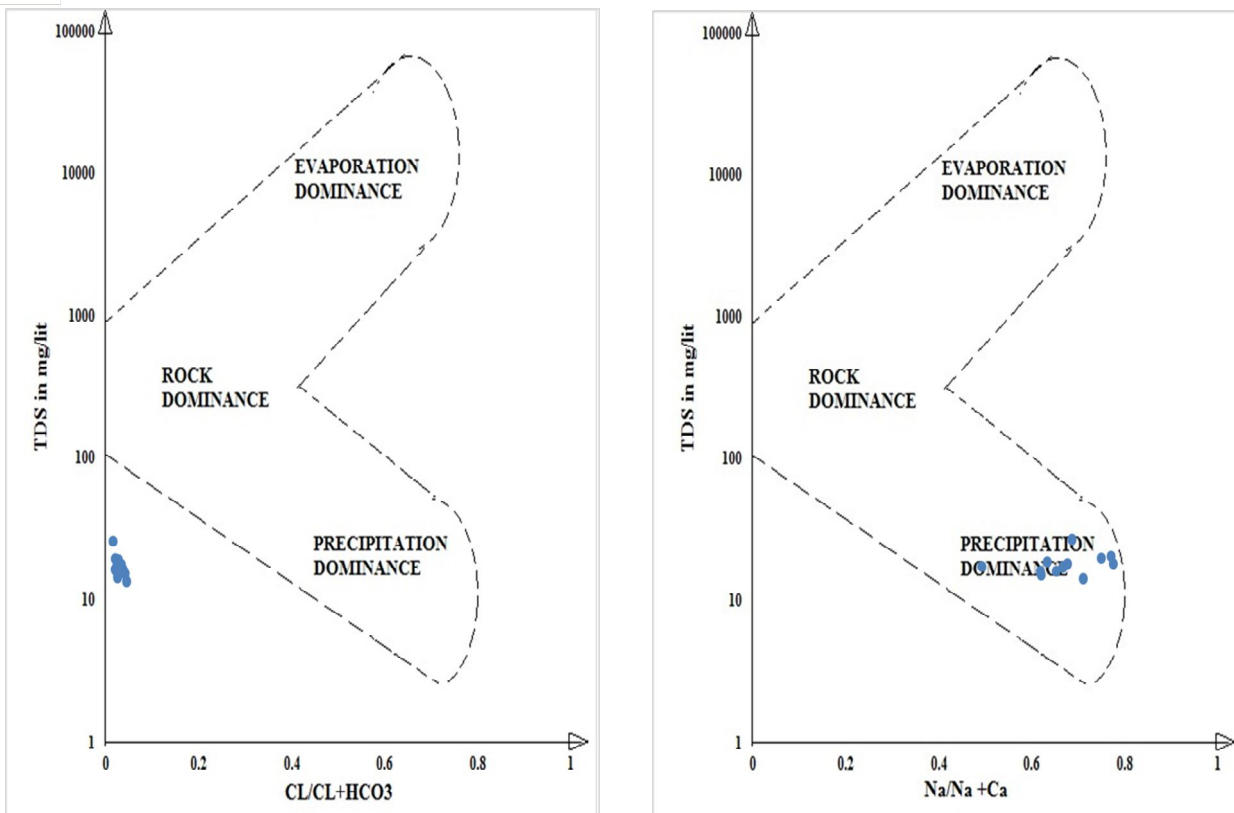
C. Classification of groundwater based on Gibbs Variation diagram

The Gibbs variation diagrams (Fig.3.a-b) of pre and post-monsoon seasons suggest the chemistry of groundwater is controlled by precipitation dominance.



(a) Post-monsoon





(b) Pre-monsoon

V. CONCLUSIONS

On the basis of Piper Trilinear diagram the chemical quality of dug well, bore well and surface water samples of Kala Nala basin, reveals that, 25% samples of pre and post-monsoon seasons represent $\text{HCO}_3 + \text{CO}_3$ type, 41.67% $\text{Ca}(\text{Mg})\text{HCO}_3$ type and 33.33% $\text{Na}(\text{K})\text{HCO}_3$ type of hydro chemical facies. Based on U.S. Salinity diagram groundwater samples of post-monsoon season and pre-monsoon season, 25% samples are fall in C4 – S3 field, 75% samples are in C4 – S2 field and 25% samples are fall in C4 – S3 field, 25% samples are in C4 – S2 and 50% samples are fall in C3 – S2 field respectively. The water sample shows result of medium to very high salinity hence water is unsuitable for irrigation purpose. The Gibbs variation diagrams of pre and post-monsoon seasons suggest the chemistry of groundwater is controlled by precipitation dominance.

VI. ACKNOWLEDGEMENT

We express our sincere thanks to our H.O.D. Prof. N. K. Patil and our college for providing us with a platform to excel in life. With a sense of regard and gratitude to our project, we would like to thank our guide Mr. A. A. Lole for his guidance, interest and constructive suggestion during the study course. This project would not have been possible without his support and help. We thank him for his valuable and immense knowledge and timely help, which made this, project a reality. We would also like to thank Director Dr. V. V. Kulkarni for his valuable support. We are very thankful to those who helped directly & indirectly to carry out this Project.

REFERENCES

- [1] Aradhi K. Krishna, 2009. Assessment of heavy metal pollution in water using multivariate statistical technique in an industrial area of Patancheru , Medak District, Andhra Pradesh, India. *Journal of hazardous materials* 167 (2009) 366-373.
- [2] G.S Gill and Harish Arora 2010. Determinants for contamination risk zonings of groundwater – a case study of an industrial town of Punjab. *Water availability and management in Punjab* 1-24
- [3] T. Rajaram, Ashutosh Das 2008. water pollution by industrial effluents in India: Discharge scenario and case for participatory ecosystem specific local regulation. *Futures* 40 (2008) 56-59.
- [4] Kaushik. A, Sharma H.R, Jain. S, Dawra. J, Kaushik. C.P, (2010), Pesticide pollution of River Ghaggar in Haryana, India, Springer
- [5] Ahemd,S.S.,Muzumdar,Q.H., Jahan, C. S., Ahmed, M. andIslam,S.(2002):Hydro-chemistryand classification of groundwater, Rajshani city corporation area, Bangladesh, *Jr.Geol. Soc.,India*, Vol.60(10),pp.441-418.
- [6] APHA, AWWA, WPCFC (1992): Standard methods for the estimation of water and waste water (19THEdn),



- [7] Washington. D. C., pp. 6-187.
- [8] Gibbs, R. J. . (1970): Mechanisms controlling World's Water Chemistry, Science, Vol. 170, pp. 1088 – 1090.
- [9] ISI, Indian Standards Institution, (1983): Indian Standards Specifications for Drinking water, Pub. No. IS10500-1983, Indian Standard Institution, New Delhi.
- [5] Karanth K. R. (1987): Groundwater assessment, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 720p.
- [10] Panaskar, D. B., Yedekar, D.B. and Deshpande, S.M. (2007): Assessment of groundwater quality of Nanded City, Maharashtra, Gondwana Geological Magazine Special Vol. No. 11, pp. 77-86.
- [11] Pawar, N. J. (1993): Geochemistry of carbonate precipitation from the groundwater in the basaltic aquifers: An equilibrium thermodynamic approach, Jr. Geol. Soc. , India, Vol. 41, pp. 119 – 131.
- [12] Piper A. M. (1953): A Graphic procedure in the geochemical interpretation of water Analysis, U. S. Geol. Surv., Groundwater Note 12, pp. 50-59.
- [13] Sawant, P. T. and Joshi, S. B.(1999): Groundwater potential and quality of SolapurMunicipal Corporation area, Maharashtra, Groundwater and Watershed Management, pp.77-84.
- [14] Shenoy, K. K. and Lokesh K. N. (1999): Quality of groundwater of bore wells in M.I.T.,campus, Manipal, Karnataka, Ind. Jr. Env. Health, Vol.41(2), pp.144-148. [11] Tiwari M. P. (1988): Some chemical characters of the groundwater in part of west coast, Ratnagiri and Sindhudurg Districts, Maharashtra, Jr. Geol. Soc. India, Vol.54(7), pp.2326.
- [15] Todd D. K. (1959): Groundwater hydrology, John Wiley and Sons Inc. Publ., 336p.
- [16] Trivedy, R. K. and Goel, P. K.(1986): Chemical and biological methods for waste pollution studies, Environmental Publication, Karad, pp.35-96.
- [17] U. S. Salinity Laboratory Staff (1954): Diagnosis and improvement of saline and alkali soils, U.S. Dept. of Agriculture Hand Book, No. 60, 160p.
- [18] WHO, World Health Organization, (2004): Guideline for Drinking Water Quality, 3rd Edition (Recommendation), World Health Organization, Geneva.
- [19] Yadav, A. S., Sawant, P. T., Pishte, J. B. and Sajane, A.S.(2011):Hydrogeological and groundwater quality studies of Jaysingpur town, Kolhapur district, Maharashtra, Env. Poll. Control Jour., Vol.14(6), pp. 71-76.
- [20] Yadav, A. S. and Sawant, P. T.(2012): Suitability of groundwater for irrigation in the Sheri Nala Basin, Sangli District, Maharashtra, India, Asian Jr. of Water, Env. AndPollu., Vol.9, No.1, pp. 91-103.
- [21] [18]Yadav, A. S. and Sawant, P. T.(2014):Groundwater Quality assessment Studies in Sheri Nala Basin, Sangli District, Maharashtra, India, Jr. Applied Hydrol., Vol. XXVII, No.1-4, pp.



10.22214/IJRASET



45.98



IMPACT FACTOR:
7.129



IMPACT FACTOR:
7.429



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089  (24*7 Support on Whatsapp)