RJC

RASĀYAN *J. Chem.*
Vol. 8 | No. 3 |355 - 361 | July - September | 2015
ISSN: 0974-1496 | e-ISSN: 0976-0083 | CODEN: RJCABP
http://www.rasayanjournal.com
http://www.rasayanjournal.co.in

PHYSICO-CHEMICAL ANALYSIS OF GROUND WATER OF MAN TAHSIL FROM MAHARASHTRA

D. Virkar Dattatray
Department of Chemistry, Mudhoji College, Phaltan, Tal.-Phaltan, Dist.-Satara, MS (India)
E-mail: ddvirkar@yahoo.co.in

ABSTRACT

Analysis of ground water samples from different locations of man tahsil was carried in the year 2012-2013. The ground water quality was assessed by examining various Physico-Chemical parameters such as pH, Electrical Conductivity(Ec),Total Hardness(TH),Total dissolved solids(TDS),calcium, magnesium, sodium, potassium, chlorides, Nitrates, sulphates and bicarbonates. The observed values of these parameters were compared with the standards given by WHO & ISI. It was found from the present study that some of the samples were found within the permissible limits, some samples shows variation in Physico-chemical parameters.

Keywords: Man tahsil ground water Physico-Chemical parameters.

INTRODUCTION

Water is one of the abundantly available substances in nature. It is an essential constituent of all animal and plant life. It is also used for irrigation, agriculture and industrial purpose. Among the natural resources ground water forms invisible component of the system. The invisible ground water resources can scientifically investigated. The analysis of water is carried in the study area which is situated in Man Tahsil Satara district of Maharashtra. The Man tahsil is drought prone zone of satara district. It is lies between $17^0$38' 24" N Latitude and 74^0 46' 11" longitudes. In Man tahsil monsoon is always irregular due to that underground water contains many salts. The domestic waste and municipal waste also percolate into the underground water. The people residing in this tahsil are completely depend on well and bore well water for domestic and agriculture purpose. Hence quality of ground water is very significant. The water samples were collected from the various places in the study area during period of pre-monsoon and post-monsoon in the year 2012-2013 and physic-chemical characteristics has been studied. The chemical analyses were carried out based on the procedure stipulated by APHA (1995). The water quality parameters viz pH, Electrical conductance (Ec), Total dissolved solids (TDS), Total Hardness(TH), alkalinity, Calcium (Ca), Magnesium (Mg), Sodium (Na),Potassium (K), Chlorides (Cl), Sulphates (SO_4), Nitrate(NO_3) and bicarbonates have been studied. Map of Man tahsil showing position of sampling stations given (Figure-1).

EXPERIMENTAL

Ground Water samples were collected from 12 different villages of man tahsil (Table-1) in the month October-November 2012(Post- monsoon) and April-May 2013(Pre-monsoon). The samples were collected in plastic bottles having capacity of 1 litre. These bottles were labelled properly and analysed in laboratory, PH meter of model L/11/L1610, Elicomake was used for determination of PH. The Conductivity meter model CM 180, Elicomake was used to electrical conductance, TDS meter model EUTECH instrument AKTON TDS was used to determine TDS. Flame photometer of systronic make was used to determine NQ^+& K^+. The other parameters were used analysed by using standard methods (APHA-AWWA and WPCF 1995).

Table-1: Different sample locations and their notation

Sample No.	Location
W_1	Mahimangad
W_2	Dahiwadi
W_3	Lodhawade
W_4	Mahswad
W_5	Kukudwad
W_6	Shenawadi
W_7	Paryanti
W_8	Shinganapur
W_9	Mogarale
W_{10}	Palvan
W_{11}	Mardi
W_{12}	Andhali

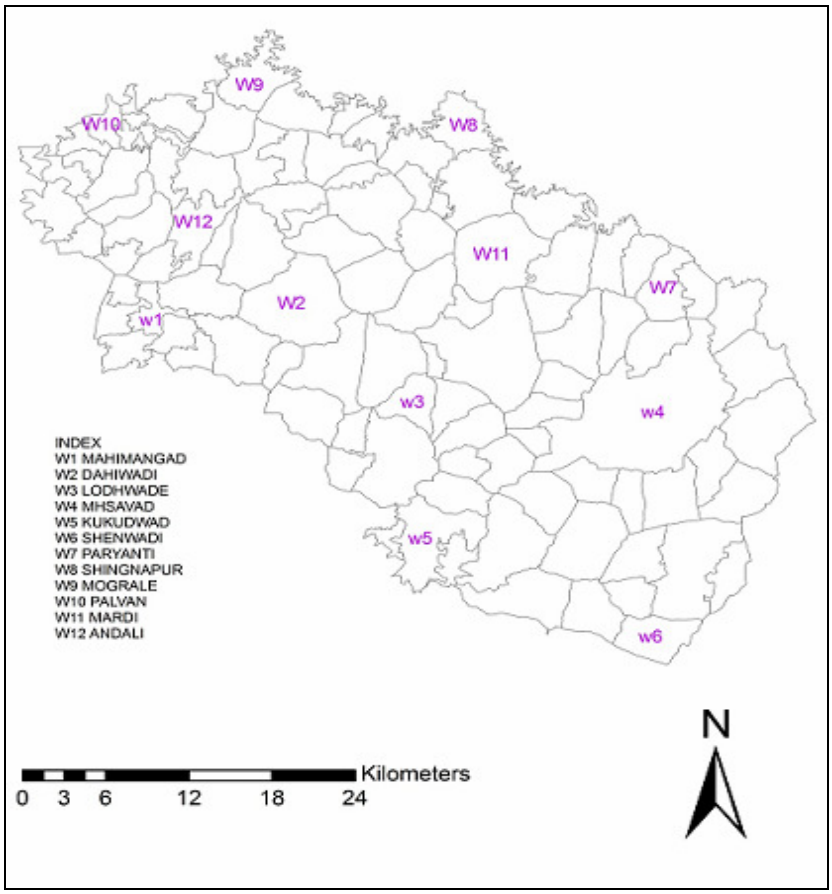

Fig.-1: Map of Man tahsil showing position of sampling stations

RESULTS AND DISCUSSIONS

The results obtained from the analysis of water samples of 12 villages (Table-1) pre monsoon and post monsoon of Man tahsil are given in Table-2 (pre-monsoon) and Table-3 (post-monsoon) respectively. The results were compared with drinking water standards (WHO 1988), (ICMR1994). Results are summerised in Table-4.

Table-2: Physico-Chemical Data of the Ground Water of Man Tahsil, Satara, Maharashtra Summer Season 2010-11

S.No.	pH	EC	TDS	TH	Ca^{++}	Mg^{++}	Na^{+}	K^{+}	HCO_3^{-}	SO_4^{-}	NO_3^{-}	Cl^{-}
W 1	8.3	0.40	540.4	1092	244.3	119.2	544.1	16.3	760.5	294	18.7	184.1
W 2	6.8	0.332	1950	962.5	155.3	142.3	247.5	12.3	830	166.2	25.3	173.5
W 3	8.1	0.671	596.3	1090	246.2	119.2	540.1	16.2	640.1	395.2	23.5	193.7
W 4	8.3	0.991	672.1	1194	265.3	133	690.3	17.1	560.4	497.1	24.5	284.2
W 5	7.3	0.785	417.2	970	216.3	108.3	532.3	16.1	721.0	454.1	27.7	266.2
W 6	9.2	0.77	670.4	1375	330.2	140.1	600.3	18.3	1000	472.1	22.1	283.5
W 7	7.7	0.512	440	1255	202.3	188.3	500.1	14.5	352.3	300.2	22.30	176.3
W 8	7.9	0.901	4432	1160	285.3	112.0	580.1	22.5	900.3	554.1	33.1	378.5
W 9	6.8	0.702	464	1095	199.7	139.2	340.2	16.1	632.4	399.5	22.6	232.5
W 10	6.9	1.05	660.1	1966	332.4	281.3	540.3	19.2	251.2	790.1	20.1	460.0
W 11	7.3	0.87	557	447	160	112	236	13.4	268	171	14	140
W 12	8.0	1.18	755	415	130	104	180	12.4	415	166	34	160
Min.	6.8	0.33	417	415	130	104	180	12.4	251.2	166	14	140
Max.	9.2	1.18	4432	1966	332	281.3	600.3	22.5	1000	554.1	34	460
Avg.	7.7	0.76	1012	1081	230	141.5	460	16.2	611	388	24	244.4

and 2011-12

Note- All values of the constituents are in mg/l; expect pH and EC (mhos/cm), TDS- Total Dissolved Solids, TH- Total Hardness

Table-3: Physico-Chemical Data of the Ground Water of Man Tahsil, Satara, Maharashtra Winter Season 2010-11 and 2011-12

S.No.	pH	EC	TDS	TH	Ca^{++}	Mg^{++}	Na^{+}	K^{+}	HCO_3^{-}	SO_4^{-}	NO_3^{-}	Cl^{-}
W 1	6.2	0.43	300.0	710.5	135.2	119.2	350.4	11.2	730.1	250.3	15.3	203.1
W 2	6.5	0.33	3220	850	187.1	124.1	148.7	9.8	860.3	150	19.2	211.1
W 3	6.4	0.351	330	975	128.4	140.1	310.3	13.2	503	300	16.2	220
W 4	6.9	0.41	324.6	925	170.1	125.1	290.1	13.0	1120	350.3	20.18	219.2
W 5	6.4	0.44	238.5	575.2	146.1	110.8	410.3	12.8	810.3	380.1	25.4	231.5
W 6	6.3	0.351	300.2	816.3	164.4	118	315.1	11.8	605.1	370.0	18.2	200.8
W 7	6.2	0.43	280.2	765.0	176.1	107.2	140.3	7.8	431.2	246.9	15.0	202.2
W 8	6.8	0.324	323	703	135.2	132.2	314.3	15.3	950	410	29.3	198.7
W 9	6.4	0.402	424.5	835.2	134.2	117.3	215.7	8.7	730	350	21.45	199.0
W 10	6.2	0.87	500.7	904.3	147.2	118.3	225.6	10.7	340.2	610.3	19.3	195.2
W 11	7.1	0.80	515	607	140	110	185	16.1	410	205	19	180
W 12	6.8	0.5	410	555	132	120	195	13.0	398	198	22	197
Min.	6.2	0.324	238	555	128.2	107.2	148.7	7.8	340.2	150	15.0	180
Max.	7.1	0.87	3220	975	187.1	132.2	410.3	16.1	1120	610.3	29.3	220
Avg.	6.5	0.47	596	768	149.5	120	258	12	657	318.4	20.0	204

Note- All values of the constituents are in mg/l; expect pH and EC (mhos/cm), TDS- Total Dissolved Solids, TH- Total Hardness

pH

pH accounts the acidity and alkalinity[1] of water. pH values of all the samples from both the season are within the permissible limit except 9.2 value of sample No.6 (Shenwadi) in the pre monsoon may be due to accumulation of salt in water, variation of anthropogenic activities[2].

Electrical Conductivity (Ec)

These values of all the samples from both the season range from 0.3 to 1.18 mmhos and indicate the presence of some ionic water in water sample. All the values are within permissible limit the conductivity of water depends on the concentration of ions and its nutrient statues[3].

Total Dissolved solids (TDS)

The TDS of water includes all the soluble ionised or non ionised material due to the vegetable decay evaporation, disposed of effluent and chemical weathering of rocks. In the present study maximum value 4432 is observed in the sample No.8Shingnapur, Dahiwadi in pre monsoon and 3320in sample No.2 Dahiwadi in post monsoon. Higher TDS affect water quality and is unsuitable for the portability and industrial applications[4].

Excessive concentration of TDS in ground water affect the human health induces unfavourable physiological reaction and aesthetically unsatisfactory for bathing, washing and increases the boiling point[5,6]. High TDS is due to discharge of waste water into pit ponds and the lagoons enabling the waste percolate down to the water table[7]. The higher TDS values leading to higher ionic concentration and causes gastro intestinal complications[8].Excessive amount of TDS may be unsuitable for aquatic life and also for crop irrigation. Higher values are obtained in premonsoon and lower values obtained in post monsoon.[9] The values of pre monsoon and pre monsoon were graphically compared in figure-2.

Table-4: Standards for Drinking Water

Physical Parameters	ICMR (1994)		
	P	P	P
Taste And Odour	Objectionable	Unobjectionable	Unobjectionable
pH	5-8.5	7.0-8.5	7.0-8.5
Electrical Conductivity	-	-	-
Total Dissolved Solids	500	300	500
Chemical Parameters			
Total Hardness	300	300	-
Calcium	75	75	75
Magnesium	30	50	50
Sodium	150	-	200
Potassium	-	-	-
Bicarbonate	200	-	500
Chloride	250	250	200
Sulphates	200	200	200
Nitrates	45	20	-

Note: P: Permissible Limit. All units are expressed in mg/l except pH and EC (mohos/cm)

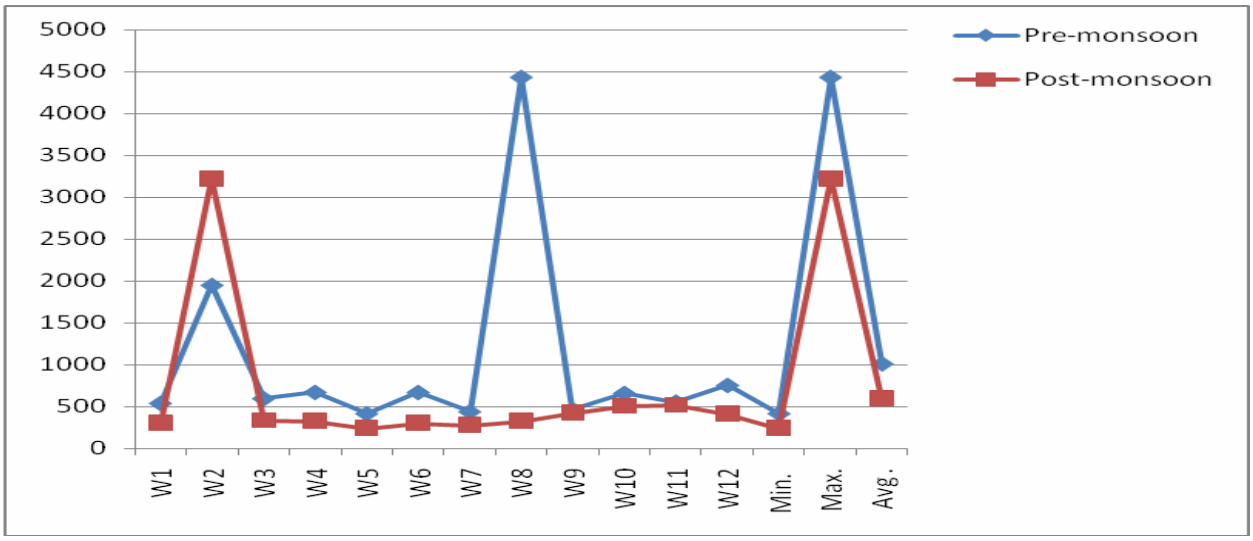

Fig.-2: TDS

Total hardness (TH)

Hardness of water caused by dissolved metallic like calcium, magnesium, strontium, barium with their bicarbonates, chlorides, sulphates and nitrates. It may be discussed in terms of carbonate (temporary) and non carbonates (permanent) hardness.[10]

In the present study the maximum values are observed at most of sampling stations in the pre monsoon season and minimum values are in the post monsoon season.[9] The values in pre monsoon and post monsoon were compared graphically in figure-3.

Higher values of hardness can be attributed to low water level and high pumping rates. High value of TH induces unfavourable physiological reaction and prevents the formation of lather with soap and increases the boiling point.[11] High concentration of TH causes kidney problem.[6,12]

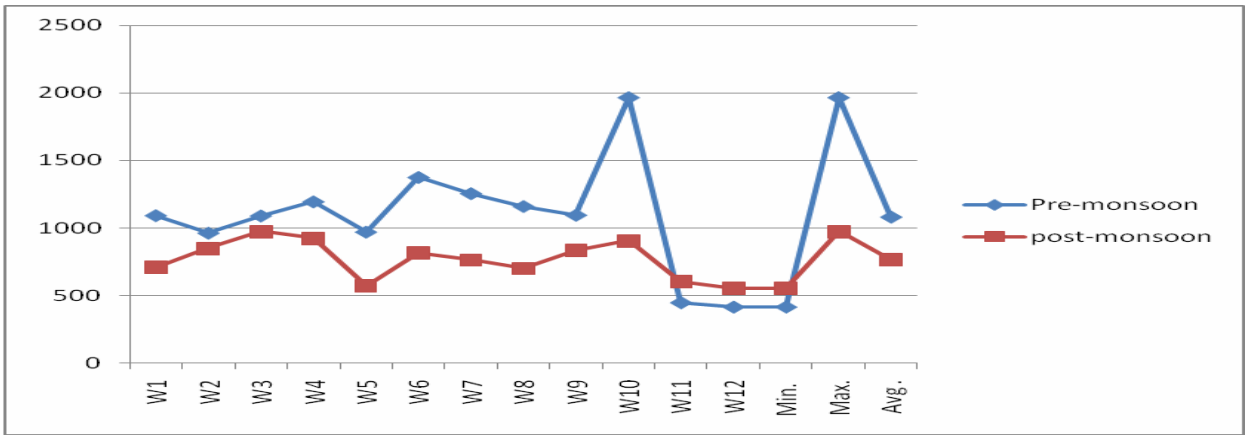

Fig.-3: Total Hardness

Calcium

The calcium is common constituents of natural water and important contributors to the hardness of water. Calcium values observed for pre monsoon (summer) season are higher than the values observed for post monsoon (winter) season which are shown graphically in figure-4. The higher value observed in summer season may be due to evaporation of water content and accumulation of salt.[9]

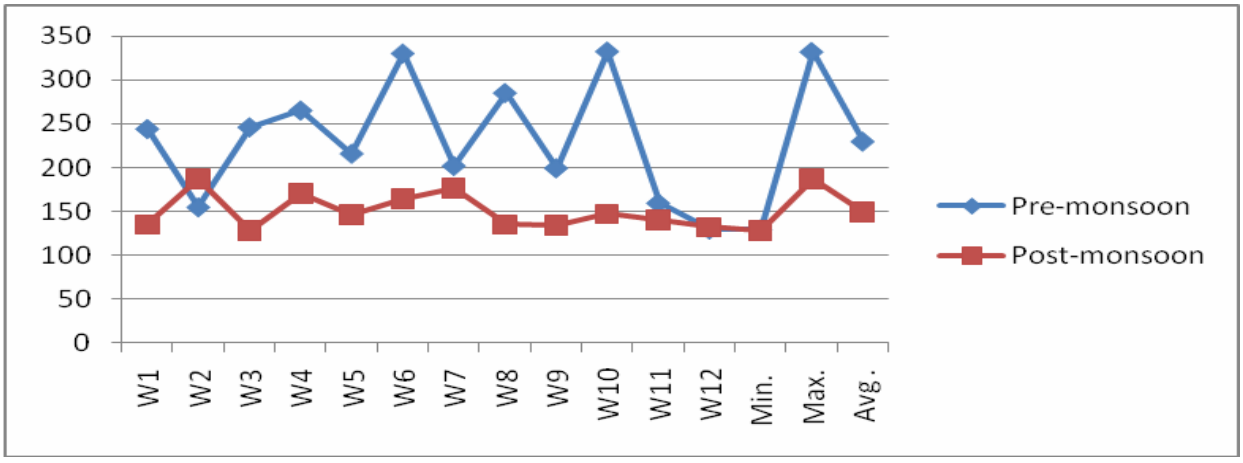

Fig.-4: Calcium Hardness

Magnesium

Concentration at magnesium is within the permissible limit only few samples for pre monsoon (summer) have higher concentration of magnesium has laxative effect on human health[4]

Sodium and Potassium

The concentration values of sodium obtained from both the season are beyond the permissible limit. These are higher in pre monsoon (summer) season due to evaporation of water. The higher concentration of sodium salt affects the soil permeability, structure and creates toxic condition for plant. The concentration of potassium is in permissible limit for the season (Fig.-5).

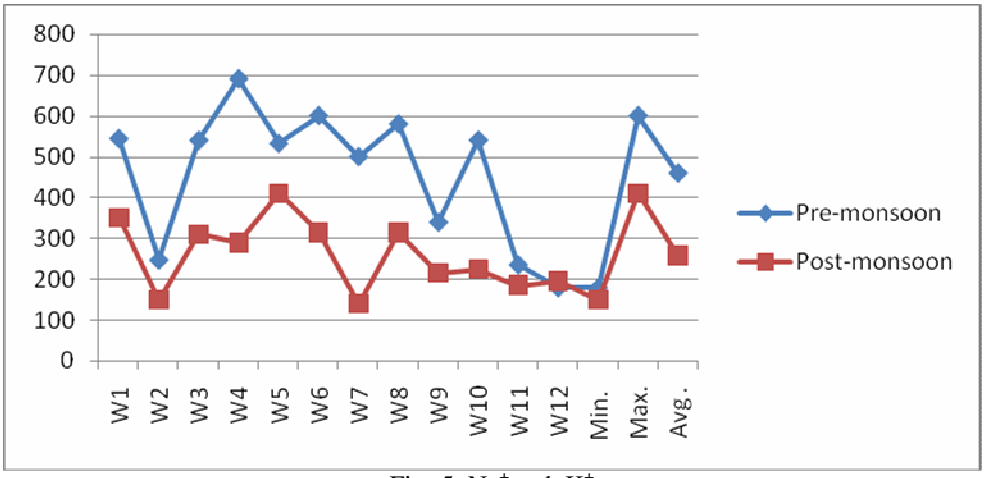

Fig.-5: Na^+ and K^+

Alkalinity

The bicarbonate (HCO3-) alkalinity is determined and it is observed that, alkalinity in some samples for the seasons are in the excessive limit. But most of the samples within permissible limit.

Sulphate

Ground water in igneous rocks[13]. Generally contains less than 100 ppm sulphates. The concentration of sulphates in most of samples is found to be within permissible limit, a few are beyond the permissible limit. There is no major difference in between both seasons.

Nitrates

Concentrations of nitrates are in permissible limit for both the season. It may be due to agricultural runoff. Nitrate pollution problem is mainly occurred in irrigated area. A farmer uses high quality of nitrogenous fertilizers.

Chlorides

Concentration of chloride for the samples from both the season within the permissible limits only a few samples from summer season are beyond limit. Chloride content in fresh water is largely influenced by evaporation and precipitation.[14]

CONCLUSION

In general ground water quality of Man Tahashil is not so harmful in post monsoon season but it is harmful in the premonsoon season due to higher values of TDS , TH and Ca. It creates the kidney stone problem.

REFERENCES

1. P.K. Saxena, S. Jobben and R.Sahai,*Geobios*,**15**,107 (1988)
2. B. Kotaiah and N. Kumaraswamy, Environmental Engineering Laboratory Manual, Charotat Publishing House (1994).
3. Ashutosh Gautam, Ecology and pollution of mountain wasters, Ashish Publishing House, New Delhi, India, p.45(1990)
4. A.J.Dhembare, G.M. Pondhe, and C.R. Singh, *Journal of Pollution Rea*search, **17**, **(1),**87(1998)

5. A. Abdul Jameel, Evolution of Drinking water quality in Tiruchirapalli, Tamilnadu, **44 (2),**108(2002)
6. N. B. Y. Reddy and K.S.S.Prasad, *Journal of IAEM*, **32(2),** 64(2005)
7. G.Achunathan Nair, K. Premkumar, A. Muftan, Mariami and Jalal Ahmad Bohjun, *Indian Journal of Enviromental Protection*, **24 (6)**,481(2005)
8. Mahesa Nagaraja Naik and Rajendra Prasad, *Indian Journal of Environmental Protection* **24(12),** 897(2004).
9. Chhaya V.Wagh, Sundarshan J. Kokate, Haribhau R. Aher and Shashikant R. Kuchekar, *Rasayan.J.Chem.,* **2(1),** 234(2009).
10. N. J. Pawar, *J.Geol. Soc. of India* , **41,** P119(1993).
11. Sanjay Gupta, Akhalesh Kumar, C.K. Ojha and Gita Seth, *Journal of Environmental Science and Engineering*, **46 (1),**74 (2004).
12. S. L. Davis and R. J. M. De Wiest, Hydrology, John Wielley and Sons. Inc, New York (1996)
13. C.K.Jain, K.K.S. Bhatia and T.Vijay, *Ind. J. Environmental Health*, **39(3),** 182(1998).
14. N.Kumarswamy, *Poll. Res*., **10**13(1991).

[RJC-1319/2015]