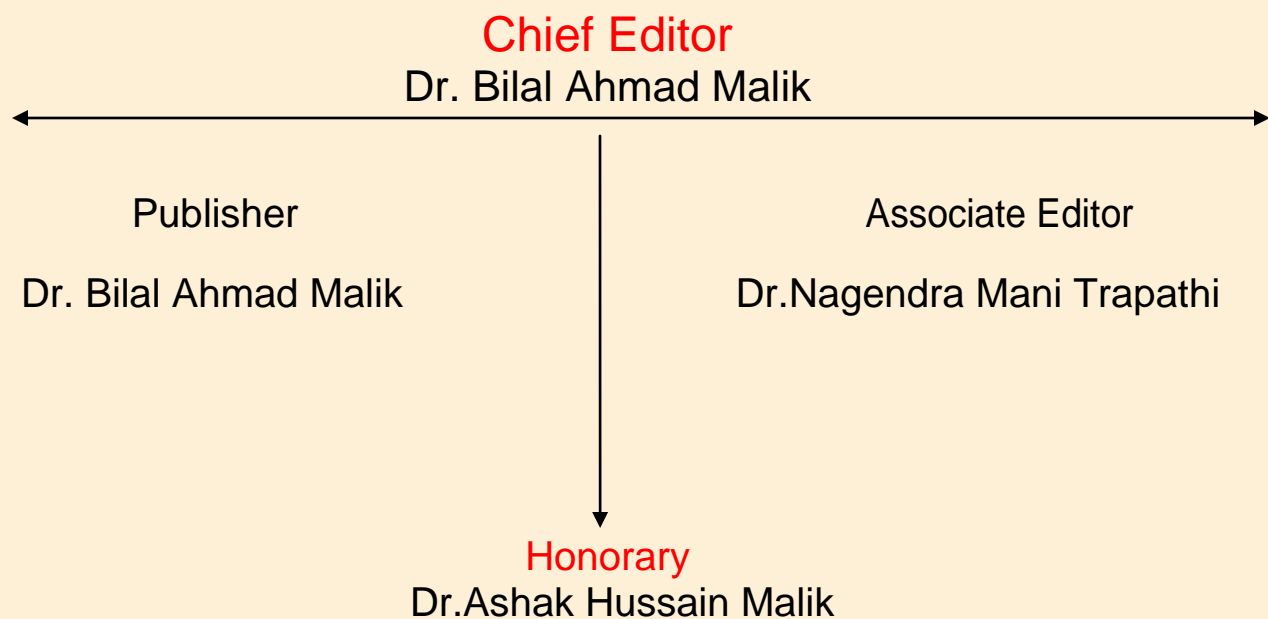


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ASSESSMENT OF UNDER GROUND WATER QUALITY OF KHATAV TAHSIL IN SATARA DISTRICT FROM MAHARASHTRA (INDIA)

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ABSTRACT

Analysis of ground water samples from different locations of Khatav 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.

Key words: Khatav 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 present study which is situated in Khatav Tahsil Satara district of Maharashtra. The Khatav Tahsil is drought prone zone of satara district. It is lies between 17^oN Latitude and 74^oE longitude. In Khatav Tahsil monsoon is always irregular due to that underground water contains many salts. The domestic waste and Grampanchayat 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 analysis was 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(SO₄), Nitrate(NO₃) and bicarbonates has been studied.

Different sample location and there notations of Khatav Tahsil given in Table No. 1

Table No. 1

Sample No.	Location
W ₁	Vaduj
W ₂	Khatav
W ₃	Pusegaon
W ₄	Aundh
W ₅	Pusesavali
W ₆	Mayani
W ₇	Vardhangadh
W ₈	Visapur
W ₉	Rajapur
W ₁₀	Diskal
W ₁₁	Nimsod
W ₁₂	Daruj

Table No. 2

Parameters	ICMR (1994)	WHO (1988)
pH	7.0 - 8.5	6.5 - 8.5
Electrical Conductivity	-	-
Total Dissolved Solids	300 - 600	500 - 1500
Total Hardness	300 - 600	300 - 600
Calcium	75 - 200	75 - 200
Magnesium	50 - 150	50 - 150
Sodium	-	200
Potassium	-	-
Bicarbonate	-	500 - 1000
Chloride	250 - 1000	200 - 600
Sulphate	200 - 400	200 - 400
Nitrate	20 - 50	50 - 100

Values of the all constituents are in mg/L, except pH and EC

EXPERIMENTAL

Ground Water samples were collected from 12 different villages of Khatav Tahsil 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 Na⁺ & K⁺. The other parameters were analysed by using standard methods (APHA-AWWA and WPCF 1995).

RESULTS AND DISCUSSIONS

The results obtained from the analysis of water samples of 12 villages from Khatav Tahsil are given in table No 3(post monsoon) and table No 4(pre monsoon). The results were compared with drinking water standards (WHO 1988), (ICMR1994), these are represented in Table No - 2

Table No.3

**Physico-Chemical Data of the Ground Water of Khatav Tahsil, Satara,
Maharashtra Post – monsoon Season (2011-12)**

Sr.No.	pH	EC	TDS	TH	Ca ⁺⁺	Mg ⁺⁺	Na ⁺	K ⁺	HCO ₃ ⁻	SO ₄ ⁻	NO ₃ ⁻	Cl ⁻
W1	6.2	0.623	243.8	801.4	160	123.3	440.3	12.1	800.2	395.5	27.3	222.4
W2	6.3	0.843	300.2	900.7	122.5	113.2	215.7	14.2	602	450	26.7	246.3
W3	6.5	0.543	2835	835.3	118.5	132.9	250.8	11.3	900.2	190	26.5	250.0
W4	6.2	0.422	2945	609.0	120.1	120.0	180.5	9.3	830	170	24.7	233.2
W5	6.1	0.893	3935	970.3	122.0	100.2	225.6	8.9	950.4	200.2	26.10	198.3
W6	6.4	0.427	3245	826.4	194.0	103.6	147.3	10.3	970.2	170.3	18.2	200.0
W7	6.1	0.283	2457	596.0	109.3	103.9	305.3	8.4	710.1	181.2	14.3	198.7
W8	6.3	0.473	394.1	1105	188.1	102.4	180.3	9.3	680.3	530.4	17.5	196.3
W9	6.2	0.312	285.1	691.1	140.1	104.2	120.4	5.3	930.2	150.4	12.3	145.3
W10	6.5	0.410	433.5	812.3	146.2	116.3	190.4	8.1	840.5	290.3	17.5	197.4
W11	6.3	0.88	3015	950	120	95	210	9.2	930	200	27.1	200
W12	6.4	0.51	410	1054	190	100	190	9.8	650	440	18.5	198.4
Min.	6.1	0.28	243.8	596.0	109.3	95	120	5.3	602	150.4	12.3	145.3
Max.	6.5	0.89	3935	1105	194	132.9	440	14.2	970	530.4	27.3	250.0
Avg .	6.3	0.55	1708	845.7	144	109	221	9.6	816	280	21.3	207

Note- All values of the constituents are in mg/L, except pH and EC mmhos/cm)

TDS- Total Dissolved Solids

TH- Total Hardness

Table No.4

**Physic-Chemical Data of the Ground Water of Khatav Tahsil, Satara,
Maharashtra Pre - monsoon Season (2012-13)**

Sr.No.	pH	EC	TDS	TH	Ca ⁺⁺	Mg ⁺⁺	Na ⁺	K ⁺	HCO ₃ ⁻	SO ₄ ⁻	NO ₃ ⁻	Cl ⁻
W1	7.8	0.80	432.1	1086	270.2	110.7	525.4	18	750.5	445.2	29.8	275.2
W2	7.9	1.05	600.0	1392	325.3	145	601.2	24.1	460	668.1	33.4	441.8
W3	7.3	0.710	3216	1190	180.3	185.3	440.3	16.3	980.2	235.7	27.2	193.2
W4	7.1	0.68	2887	986.1	161.0	146.3	331.8	14.9	782.3	199.3	26.7	179.3
W5	7.5	1.13	1752	1110	140	190.2	442.3	18.6	904.4	253.1	29.6	200.0
W6	6.9	0.448	1975	1120	176.3	170.5	332.3	14	926.1	186.3	26.4	185.6
W7	7.2	0.388	3400	1088	150.3	178.5	378	12.4	821.2	197.4	20.9	163.4
W8	6.8	0.992	556.1	1605	290.2	220.3	445	17.3	521.2	677.2	18.5	354.5
W9	7.7	0.345	554.3	996.0	133.3	166.3	254.2	11.5	940.4	188.6	20.0	155.5
W10	7.1	0.557	532.4	916.0	132.1	147	336.0	14.2	730	425.4	19.3	222.3
W11	7.6	1.1	1640	1050	138	170	420	19.2	809	263	30.6	195
W12	6.8	0.97	566	1512	285	210	440	18.4	501	655	19.5	340.5
Min.	6.8	0.34	432	916	132.1	110.7	254.2	11.5	460	188.6	18.5	155.5
Max.	7.8	1.13	3400	1605	325.3	220.3	601.2	24.1	980.2	677.2	33.4	354.5
Avg .	7.3	0.75	1509	1170	198.5	170	412	16.5	758	366	25	242

Note- All values of the constituents are in mg/L, except pH and EC mmhos/cm)

TDS- Total Dissolved Solids

TH- Total Hardness

pH- pH accounts the acidity and alkalinity of water¹.PH values of all the samples from both the season are within the permissible limit.

Electrical Conductivity (EC) - These values of all the samples from both the season ranges from 0.283 to 0.893 mmhos/cm and indicate the presence of some ionic water in water sample. All the values were within permissible limit the conductivity of water depends on the concentration of ions and its nutrient statuses^{2,3}.

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 3935 is observed in the sample No W5 Pusesavali, also sample No W3, W4, W5, W6 and W7 the values were found to be above permissible limit in pre monsoon and in post monsoon.

Higher TDS affect water quality and is unsuitable for the portability and industrial applications⁴.

Excessive concentration of TDS in ground water affect the human health induces unfavorable 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 table⁷. The higher TDS values leading to higher ionic concentration and causes gastro intestinal complications⁸.Excessive amount of TDS may be unsuitable for aquatic life and also for crop irrigation. Higher values are obtained in pre-monsoon & lower values obtained in post monsoon.⁹

The higher value of TDS could be due to low water levels within aquifers and sediments affect higher TDS value recorded in summer season.

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.^{2,9}

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}

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). The higher value observed in summer season may be due to evaporation of water content and accumulation of salt.^{2,9}

Magnesium: Concentration of magnesium is within the permissible limit only few samples for pre monsoon (summer) have higher concentration of magnesium. It has laxative effect on human health⁴.

Sodium and Potassium: The concentration values of sodium obtained from both the season are within the permissible limit. These are higher in pre monsoon (summer) season due to evaporation of water. The concentration of potassium is in permissible limit for both the season.

Alkalinity: The bicarbonate (HCO_3^-) 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 rocks¹³. Generally contains less than 100 ppm sulphates. The concentrations of sulphates of all samples were found to be within permissible limit. There is no major difference in between both seasons

Nitrates: Concentrations values of nitrates were in the 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 values of chloride were found to be within the permissible limits for both the season. Chloride content in fresh water is largely influenced by evaporation and precipitation.¹⁴

CONCLUSION

The values of pH, EC, Ca, Mg, Alkalinity, Nitrate and chloride were not harmful as these were within the permissible limit. But the values of TDS and TH were found to be beyond the permissible limit. Therefore in general ground water quality of Khatav Tahshil is not so harmful in post monsoon season but it is harmful in the pre-monsoon season.

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