

**STUDY OF GROUND WATER QUALITY OF SAKUR VILLAGE IN  
SANGAMNER TAHSIL OF AHMEDNAGAR DISTRICT, MAHARASHTRA,  
INDIA**

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**ABSTRACT**

Water is an absolutely necessity of life as well as a universal solvent. It contains dissolved materials and suspended particles even in its natural state. Due to overuse of irrigation water and chemical fertilizers coupled with increase in agro-based industries has started deteriorating the soil and water resources. In the present study water samples were collected from 16 sampling sites during post monsoon season from different villages of Sakur in Sangamner tahasil, Ahmednagar district attempt was made to evaluate groundwater pollution. Different physicochemical parameters were measured and the samples were analyzed. The surface water physicochemical parameters included pH, temperature, total dissolved solids, electrical conductance (EC) bicarbonate, calcium, magnesium, chloride, sodium etc.

**Keywords:** Physico-chemical study, Water parameter, Ground water, Sangamner tahasil.

## INTRODUCTION

Water is the most essential substance after air, for the support of life on earth. Our life depends on water and man needs water for his drinking and other domestic and industrial purposes<sup>1</sup>. The unique properties of water which makes it universal solvent and a renewable resource also make it a substance which by virtue of these properties has got a much greater tendency to get polluted. Water can be regarded polluted when it changes its quality or composition either naturally or as a result of human activities, thus becoming less suitable for drinking, domestic, agricultural, industrial, recreational, wild life and other uses for which it would have been otherwise suitable in its natural or unmodified state<sup>2</sup>. The consequences of urbanization and industrialization leads to deterioration of quality of the water<sup>3</sup>. During last few decades, it is observed that ground water get polluted drastically because of Rapid industrialization, improper solid and toxic waste management<sup>4-5</sup>.

Use of ground water for various purposes are mainly depends upon its intrinsic quality of water, hence it is prime important to know the quality of water resources in the region. The physico-chemical contaminants that adversely affected the quality of groundwater is likely to arise from a variety of sources, including land application of agricultural chemicals and organic wastes, infiltration of irrigation water, septic tanks, and infiltration of effluent from sewage treatment plants, pits, lagoons and ponds used for storage. According to WHO organization, about 80% of all the diseases in human being are caused by water. The major problem with ground water is that once contaminated, it is difficult to restore its quality. Hence there is need and concern for protection and management of ground water quality<sup>6</sup>.

It is therefore necessary that the quality of drinking water should be checked at regular time interval as well as to find out various sources which increased ground water pollution. Thus in this present study an attempt has been made to assess the physicochemical characteristics of ground water of different locations in Sangamner area.

### **Study Area:**

Sakur Village is located in the northern part of the Ahmednagar district of Maharashtra State. Sakur Village is situated at 19°3'N and 74°2'E, on the banks of the Mula River in Sangamner Tehsil. It has an average elevation of 509 metres from mean sea level.

## MATERIALS AND METHODS

The current study was designed to investigate the quality of groundwater in the study areas. The study was undertaken by randomly collecting 16 groundwater samples from dug wells and bore wells from different villages of Sakur in Sangamner Tehsil in December 2015. Samples were drawn with a pre-cleaned plastic polyethylene bottle. Prior to sampling, all the sampling containers were washed and rinsed thoroughly with the groundwater. Water quality parameters such as pH, electrical conductivity (EC) and total dissolved solid were analyzed immediately. Other parameters were later analyzed in the laboratory. Calcium (Ca) and Magnesium(Mg) were analyzed titrimetrically, using standard EDTA. Chloride (Cl) was determined itrimetrically by standard  $\text{AgNO}_3$  titration. The content of Sodium (Na) in groundwater was estimated flame photometrically, employing Equiptronics FlamePhotometer. All parameters are expressed in milligrams per litre (mg/l) except pH (units) and electrical conductivity (EC). The electrical conductivity (EC) is expressed in microsimen/cm ( $\mu\text{S}/\text{cm}$ ) at  $25^\circ\text{C}$ .

**Table 1 Details of Sampling Stations**

Sampling Code	Sampling Station	Sampling Code	Sampling Station
S1	Kauthe Malkapur	S9	Hirewadi
S2	Sakur-1	S10	Mandva
S3	Jambhalwadi	S11	Desoda
S4	Pimpalgaon Depa	S12	Rankhamb
S5	Mandva (Khurd)	S13	Khanderaywadi
S6	Birewadi	S14	Darewadi
S7	Modhalwadi	S15	Shelakewadi
S8	Kumbharwadi	S16	Sakur-2

## RESULTS AND DISCUSSION

Sixteen groundwater samples were drawn from the wells of Sakur which included hand pumps, piped water supplies and mini water supply schemes and also open wells and analyzed for physicochemical parameters. The results of the physicochemical analysis are presented in tables-2. Table 3 shows the critical parameters exceeding the Indian standard – drinking water specification – 1991 [9], permissible limits along with the permissible limits for these parameters. Table 4 shows critical parameters exceeding the WHO drinking water standards, permissible limits along with the permissible limits for these parameters.

Study shows that Most of the water samples are slightly alkaline due to presences of carbonates and bicarbonates. All the sampling points showed the pH value lies between 7.1 to 8.7, these values are within the limit prescribed by WHO. Sodium values in the studied area lies between 22.5-85 ppm. The higher the concentration of sodium can be related to cardiovascular diseases and in woman toxemia associated with pregnancy. 16 sampling sites showed that sodium concentration lies well within the limit prescribed by WHO and Potassium values 0-3 mg/L. 2 sampling sites showed higher potassium concentration than the prescribed by WHO.

Calcium value in the studied area varied between 43.2-129.6 mg/L. Though all sampling sites showed Calcium concentration values within the prescribed limit by WHO still 14 sample sites are showing Ca concentration above the desirable limit according to WHO. If calcium is present beyond the maximum limit causes the incrustation of pipes and deterioration of clothes. Too high magnesium causes the nausea, muscular weakness and paralysis in human body when it reaches a level of about 400 mg/L. Magnesium value in the studied area varied between the 19.6 to 92.1 mg/L. 12 sample sites are showing Mg concentration above the desirable limit according to WHO. Chloride values in the studied area lies between 278-1585 mg/L. 5 sampling sites showed the higher chloride concentration than the permissible limit prescribed by WHO. It results into salty taste of water and responsible for increase in blood pressure.

**Table-2 Physico-chemical Analysis for groundwater from different areas of Sakur Village in Sangamner Tahsil, Ahmednagar, (M.S.)**

S. No.	pH	EC	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>+2</sup>	Mg <sup>+2</sup>	Cl <sup>-</sup>	HCO <sub>3</sub> <sup>-</sup>	CO <sub>3</sub> <sup>2-</sup>	TDS
S1	8.7	173.4	44	-	86.4	83.10	420	640	480	111
S2	8.1	164	47.5	-	54	65.61	526.3	720	240	105
S3	7.5	218.7	60	-	79.2	43.74	994.6	360	80	140
S4	8.3	193.7	52.5	-	115.2	56.86	934.6	440	80	124
S5	8.0	195.3	63	-	108	83.10	603.3	440	80	125
S6	7.7	123.4	22.5	-	75.6	45.92	278	880	80	79
S7	7.1	201.5	56	1.5	90	56.86	402.3	400	80	129
S8	8.4	212.5	54	-	100.8	65.61	514.6	360	80	136
S9	8.1	187.5	59	-	93.6	34.99	779	400	80	120
S10	8.5	228.1	55	3	86.4	92.17	1171	600	560	146
S11	7.8	306.2	85	-	129.6	59.04	1585.6	720	80	196
S12	7.8	182.8	44.5	-	93.6	54.67	360.6	520	80	117
S13	8.0	195.3	63	-	79.2	74.35	899.3	800	80	125
S14	7.6	217.1	44.5	-	126	78.73	710	920	80	139
S15	8.3	201.5	40.5	-	129.6	59.04	402.3	320	80	129
S16	7.5	145.3	46	-	43.2	19.68	621	24	80	93
Min.	7.1	123.4	22.5	-	43.2	19.68	278	24	80	79
Max.	8.7	306.2	85	3	129.6	92.17	1585.6	920	560	196
Average	7.9	196.6	52.3	2.2	93.1	60.8	700.1	534	145	125.8

(N.B.: All concentrations are reported in mg/l except pH and EC ( $\mu\text{Si/cm}$ ))

**Table 3 Critical parameters exceeding the desirable limit in the study area**

Parameter	Indian Standard drinking water – specification IS 10500 -1991 (Reaffirmed 2009)		Sample exceeding desirable limit	Range of samples	
	Desirable Limit	Permissible Limit	%	Min	Max
Ca mg/lit	75	200	87.50	2	14
Mg mg/lit	30	100	100	0	16
Cl mg/lit	250	1000	100	0	16

**Table 4 The number and % of samples exceeding the desirable limits set by WHO**

Water Quality Parameters	Units	WHO (2005)		No. of samples exceeding desirable limits	Percentage of sample exceeding desirable limits	Undesirable effects
		Desirable Limits	Maximum Limits			
pH	-	7-8.5	9.2	1	93.75	Bitter Taste
EC	µS/cm	1000	2000	-	-	Gastrointestinal irritation
TH	mg/L	300	500	-	-	Scale Deposition
Cl <sup>-</sup>	mg/L	200	600	16	100.00	Salty Taste, High B.P.
Ca <sup>2+</sup>	mg/L	75	200	14	87.50	Scale formation
Mg <sup>2+</sup>	mg/L	50	150	12	75.00	Encrustation in water supply structure
TDS	mg/L	500	1500	-	-	Gastrointestinal irritation

## CONCLUSION

From the present study it concludes that water in the Sakur Village is good for drinking purpose but care should be taken with respect to some parameters in order to avoid deterioration of ground water quality in future. This study emphasizes the need for regular groundwater quality monitoring to assess pollution activity from time to time for taking appropriate management measures in time to mitigate the intensity of pollution activity.

The remedial measures include:

- i) Rain water harvesting should be encouraged. Excess rain water stored should be directed to recharging wells.
- ii) Encourage the framers to use biofertilizers and biopesticides to avoid the soil, surface water and groundwater contamination.

## ACKNOWLEDGEMENT

The author is thankful to Head of Department of Chemistry, Sangamner College, Sangamner for providing all necessary research facilities.

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