

## **A study of physico-chemical parameters of ground water of Aland Taluka Phulmari of Aurangabad district, Maharashtra**

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### **ABSTRACT**

*The physico- chemical parameters such as pH, conductivity, TDS, Turbidity, Total Hardness, carbonate, bicarbonate, sulphates, nitrates, fluoride,, calcium, magnesium, sodium, potassium, iron etc were monitored continuously for two years (2009-2010) at Aland town near Phulambri District Aurangabad. A correlation matrix is constructed. A regression analysis shows good correlation between electrical conductance and TDS. All parameters were found to be below permissible limit.*

**Key words:** Physico-chemical parameters, Groundwater, Aland town, Correlation.

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### **INTRODUCTION**

The underground drinking water contamination is sometimes of geogenic origin and mostly, it is due to different kinds of anthropogenic activities of human beings. Underground drinking water is gradually accumulating pollutants since industrial revolution started[1]. Metals due to their natural abundance and by virtue of their natural usage in all sphere of life in their different chemical forms exist as ingredients of several compounds in the form of metals, inorganic, organic salts and complexes etc. Several adverse reports on metal exposure and toxicity have made human beings more conscious all over the world[2]. Aland is a town place with population density of ..... located in Phulambri Taluka of Aurangabad District. Phulambri Taluka is surrounded by hilly areas. The region is based on Deccan Platue. In order to study the pollution status of rural ground water, in continuation of our earlier work, we have carried out present study.

### **MATERIALS AND METHODS**

Groundwater samples were collected from Aland, Taluka Phulambri of Aurangabad District from January 2009 to December 2010. Physico-chemical analysis was carried out in laboratory. The pH of sample water was determined using pH meter of Elico make (model LI 120). The conductance of water was measured by using conductivity meter Elico make (model CM 180). Other parameters such as TDS, turbidity, TH, CaH, MgH, Total Alkalinity, Chloride, etc. was evaluated as the method described elsewhere [3,4]. Sodium and Potassium was determined by using flame photometer Toshniwal Pvt. Ltd. (model TMF-45). Iron was estimated using 1,10-phenonthroline For Fluoride estimation zirconyl-SPANDS reagent was used to measure at 570 nm. The nitrate concentration was determined by using UV-Visible spectrophotometer Elico make (model SL-159) at 220 nm and 275 nm. Sulphate ion is precipitated in the form of BaSO<sub>4</sub> by adding BaCl<sub>2</sub> in acidic medium and the amount of sulphate was determined using UV-Visible spectrometer

## RESULTS AND DISCUSSION

**1. Electrical Conductivity:** - There are no prescribed standard values suggested by WHO, ICMR and BIS for electrical conductance of drinking water. The importance of electric conductance is its measure of salinity, which greatly affect the taste and impart significant impact on its use. E.C. for this place was in between 369 to 732  $\mu$ S. The average E.C. was found to be 596  $\mu$ S. This represents that ground water of Aland area contains a good amount of ions. The low values are expected in summer and winter times, where high values are expected in rainy seasons<sup>5</sup>.

Table 1 Physico-Chemical parameters at station Aland

Month	pH	E.C. $\mu$ S/cm	TDS ppm	Tur NTU	TH ppm	Ca ppm	Mg ppm	Na ppm	K ppm	Fe ppm	TA ppm	CO <sub>3</sub> ppm	HCO <sub>3</sub> ppm	Cl ppm	F ppm	NO <sub>3</sub> ppm	SO <sub>4</sub> ppm
Jan-09	8.1	494	316	0.3	252	30	42	12	1	0.2	232	0	232	28	0.4	4	11
++++	7.9	694	365	0	220	65	32	32	1	0.1	214	0	214	31	0.1	12	23
Mar-09	8	510	248	0.2	314	17	23	11	0	0.3	265	0	265	25	0	36	33
Apr-09	7.1	369	187	0	187	46	45	29	3	0	198	0	198	36	0.3	19	10
May-09	6.9	549	314	0.1	269	53	17	31	2	0.5	201	0	201	64	0.6	25	46
Jun-09	7.4	471	217	0.3	164	39	36	24	1	0.3	231	0	231	55	0.9	44	33
Jul-09	7.6	722	462.1	0.2	340	76.8	36	35	2	0.1	260	0	260	64	0.9	53.16	53
Aug-09	7.2	658	326	0.2	325	54	29	20	0	0	214	0	214	39	0.4	47	47
Sep-09	7.3	732	410	0	126	63	55	36	2	0.1	124	0	124	47	0.1	36	36
Oct-09	7.8	468	269	0.1	387	22	47	29	3	0.2	209	0	209	50	0	58	54
Nov-09	6.9	698	333	0.3	401	29	34	17	0	0	178	0	178	33	0.4	12	12
Dec-09	7	447	287	0.1	188	41	33	14	1	0.4	164	0	164	12	0.8	9	10
Jan-10	7.5	562	365	0.4	272	60.8	29.2	20.1	0.5	0.2	252	0	252	28	0.1	8.9	55
Feb-10	9	700	500	2.5	28	31	34	36	1	5.2	300	54	300	50	1	12.25	70
Mar-10	8.7	680	520	0.7	290	76	39	34	0.9	1.8	290	54	290	48	0.9	25	67
Apr-10	8.4	655	500	0.5	285	74	37	31	0.7	1.5	288	0	288	45	0.7	20	64
May-10	8	640	490	0.3	270	72	34	28	0.4	1.1	270	0	270	42	0.6	45	61
Jun-10	7.9	620	480	0.2	265	70	32	25	0.2	0.9	256	0	256	39	0.4	82	59
Jul-10	7.2	600	450	0.1	255	68	28	21	0.1	0.8	240	0	240	38	0.2	71	54
Aug-10	7	580	420	0.1	250	62	25	19	0.5	0.6	235	0	235	34	0.3	37	51
Sep-10	8	600	480	0.5	300	80	38	25	0.4	1	280	0	280	40	0.6	104	55
Oct-10	7.9	590	456	0.4	350	78	34	22	0.2	0.11	259	0	259	39	0.5	128	20
Nov-10	7.7	683	444	0.3	436	101	45	27	0.1	0.14	300	0	300	48	0.8	207	13
Dec-10	8	600	490	0.2	335	80	36	20	0.5	1	250	0	250	35	0.4	102	35

**2. pH:-** The pH of groundwater depends on texture of soil though which surface water leaches into the groundwater tables. The area of Aland is hilly area; hence dissolution of salt from rock takes place, which imparts only slight basic nature. It varies between 6.9 to 9 with average 7.68 values. This shows that groundwater has not been polluted by acidic or basic salts present in the rocks<sup>6</sup>.

**3. TDS:** Total Dissolved solids in the groundwater was found to be in the range 187 to 520 mg/L, with an average of 388.7 mg/L. The dissolved solid is of covalent or ionic nature. In the present case it is ionic compounds.

**4. Turbidity:** It varies from 0 to 2.5 NTU and an average of 0.333NTU which is within the permissible limit. The water is found to be clear and transparent.

**5. Total Hardness:** Total Hardness of the present study varies from 28.00 mg/L to 436 mg/L. Hardness in water samples prevents lather formation with soap and increase the boiling point of water making it less suitable for domestic use and portability. The average value was found to be 271.00 mg/L. It shows that the total hardness is within the permissible limit<sup>7</sup>.

**6. Calcium Hardness:** Calcium hardness ranges in between 17.00 mg/L to 101 mg/L with an average of 57.85 mg/L.

**7. Magnesium Hardness:** The Magnesium hardness value varies from 17.00 mg/L to 55.00 mg/L with an average of 35.00 mg/L. The values are more for rainy season and less in the summer season.

**8. Sodium:** The amount of sodium observed in the region is 11.00 mg/L to 36.00 mg/L. The sodium concentration is significant. The (Na<sup>+</sup>)<sub>aq</sub>/(Cl<sup>-</sup>)<sub>aq</sub> ratio is in range 1.47–233.73 (in mmol/L). Halite is potential source of (Cl<sup>-</sup>)<sub>aq</sub> that may be dissolved in water as a result of interaction with common rocks. The average sodium concentration found to be 24.90 mg/L.

**9. Potassium:** The average Potassium in the groundwater of the region was found to be 0.895 mg/L. It varies from 0.00 to 3.0 mg/L.

**10. Iron:** The average Fe content of groundwater is 0.689 mg/L which is within permissible limit. And it ranges between 0-5.2 mg/L. Solubility of Iron is controlled by pH-Eh system. There may be 1 to 10 mg/L concentration of Fe in groundwater. Although, it is abundant in the earth's crust, it is absorbed in different forms at different rates and Iron deficiency is quite common among the people throughout the world but at 1.0 mg/L<sup>8</sup>.

**11. Total alkalinity:** The average alkalinity varies from 124.0 mg/L to 300.0 mg/L. The average value found to be 237.9 mg/L. Alkalinity in water is due to dioxides,

**12. Carbonates:** The average values of carbonate vary from 0.0 mg/L to 54.0 mg/L.

**13. Bicarbonates:** The bicarbonate value varies from 124.0 mg/L to 300.0 mg/L. The average value was 237.9 mg/L.

**14. Chloride:** The average of Chloride is 12.0 mg/L varying from 64.0 mg/L with an average value of 40.4 mg/L. It shows that the water is suitable for drinking purpose and no more salts are available.

**15. Fluoride:** The average of Fluoride is 0.475 mg/L which is below permissible limit. It varies from 0 to 1.0 mg/L. The Fluoride contents if increases more than 1.0 mg/L it causes dental problems.

**16. Nitrate:** The average of nitrate is 49.88 mg/L ranging from 4.0 mg/L to 207.0 mg/L. The high concentration of nitrate in the drinking water is very toxic to infants. Excess amount of nitrate in drinking water reduces the oxygen carrying power of hemoglobin<sup>9</sup>.

**17. Sulphate:** The average of sulphate is 40.5 mg/L ranging from 10.0 mg/L to 70.0 mg/L.

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