



Geo-chemical analysis of water in Akkalkot city, Dist. Solapur

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Abstract:-

Ground water is one of the predominant source of drinking and other related requirements. It has the most exploited natural system due to over increasing demand of man for food, cloths, industrialization, enormous growth of population and agriculture. The drinking water quality was analyzed in all season. The water quality parameters such as Electrical conductivity, T.D.S, Hardness, Calcium, Mg, sodium, alkalinity, Chloride and Sulphate were analyzed. The water sample collected from 12 stations. One result was compared with water quality standards of WHO, ICMR indicated that it is not suitable for drinking. So, the water needs treatment before human consumption.

Keywords: -Drinking water quality, Physiochemical parameter, Water pollution.

Introduction: - Ground water is one of the predominant source of drinking and other related requirements. It has the most exploited natural system due to over increasing demand of man for food, cloths, industrialization, enormous growth of population and agriculture. The people depend upon the groundwater as well as surface water for drinking domestic, livestock and agricultural purposes. More than 40 % of the drinking water supply to this area from ground water. An important aspect of urbanization is the increase in demand and creation of potential with the possibility of population of ground water. (Dong et al 1988)¹. The water quality was analyzed in the distribution system in entire study area. The consumption of water is increasing with population. Day by day the demand of water is causing serious strain on the planet due to the fixed water stock. So the ascertain the of drinking water being supplied and maintained, it is necessary to conduct water quality surveillance which will involve a suitable strategy for future planning.

Study area: Akkalkot's latitude is between 17°01'54.11" and 17°04'41.31" north and longitude is between 75°05'31.42" and 76°02'51.43" east. Akkalkot taluka is bordered by South Solapur tehsil to the west and by Karnataka state on all other sides. The tehsil covers an area of 1,407 km² and contains 138 villages, apart from

the town. The total population of the taluka is approximately 314,570 (2011 census), giving a population density of 222 per km². Akkalkot is a Municipal Council city in district of Solapur, Maharashtra. The Akkalkot city is divided into 21 wards for which elections are held every 5 years. The Akkalkot Municipal Council has population of 40,103 of which 20,051 are males while 20,052 are females as per report released by Census India 2011. Akkalkot Municipal Council has total administration over 7,869 houses to which it supplies basic amenities like water and sewerage. It is also authorize to build roads within Municipal Council limits and impose taxes on properties coming under its jurisdiction.

Material and Methods: -The study has been done in all seasons. Hand pumps and bore wells samples were collected from all area in brown glass bottles, with necessary precautions, during Oct.2007 to Sep. 2008. The Geo-chemical parameters viz, P^H, TDS, Hardness, Ca Mg, Sodium, alkalinity and chloride of water were analyzed following method of IS 500, P^H by digital P^H meter, total alkalinity, total hardness and chloride of water were analyzed following the methods of APHA (1989) using Hanna fresh water analysis kit.

Result and discussion: - Water sample from different locations were also examined for the physio-chemical attributes (Table No.1). It was observed that was sample from hand pump, Dug wells and bore wells entire the study area.

Physical characteristics of water sample: The entire water sample observed to be colorless. The temperature of different water samples ranged between 24° to 28°C. And no marked variation on temperature was observed during the study period. The P^H, values in sampling area ranged from 6.06 to 8.5 i.e. alkaline natures.

Chemical characteristics of water sample: Permissible quality is 1500 mg/L (WHO, 1984)² and recommended level of TDS (250-2100 Mg/L) for the protection of aquatic life (USEPA, 1975)³. Irrigation (ISI, 1982)⁴ and domestics use (ICMR, 1975)⁵. The amount of TDS ranged between 416 to 1610 mg/l. The electrical conductivity is a function of ions concentration. This can be used for quick checking of dissolved substance in water. Langeegger (1990)⁶ and Edet (1993)⁷ have described the importance of electrical conductance EC were observed.

Table no.1 Geo-chemical Analysis of Bore well Water in Akkalkot city

Sr. no	Location	PH	TDS	Hardness	Ca	Mg.	Sodium	Alkalinity	Chloride
1	Sopel Nagar	46	9	210	8	7	36	348	229
2	Khasbag Gully	52	10	750	02	9	92	523	522
3	Kumbhar Gully	9	0	208	2	6	66	330	211
4	Mujawar Gully	74	00	478	21	2	81	293	447
5	Vidhya Nagar	55	0	198	31	0	88	353	224

Source: Compiled by author

Using the five bore-well samples, here is a descriptive statistical cross-analysis. **Assumption:** all measurements other than pH are in mg/L; sample standard deviation uses (n-1). Units were not provided, so please verify them before interpreting against water-quality standards.

Summary statistics

Parameter	Mean	Median	Sample SD	Minimum	Maximum
pH	6.854	6.740	0.469	6.46	7.62
TDS	975.8	829	251.1	730	1,310
Hardness	368.8	210	237.4	198	750
Calcium (Ca)	124.8	121	47.7	78	202
Magnesium (Mg)	54.8	57	13.0	36	70
Sodium	172.6	181	23.6	136	192
Alkalinity	369.4	348	89.4	293	523
Chloride	326.6	229	139.2	211	522

Formulae used

Mean: $(\bar{x} = \frac{\sum x_i}{n})$

Sample standard deviation: $(s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}})$

Pearson correlation: $(r = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}})$

Cross-analysis: Pearson correlations

Parameter pair	Correlation (r)	Interpretation
TDS – Chloride	0.998	Very strong positive association
TDS – Alkalinity	0.741	Strong positive association
TDS – Hardness	0.695	Moderate-to-strong positive association
Hardness – Calcium	0.668	Moderate positive association
Hardness – Magnesium	0.315	Weak-to-moderate positive association
TDS – Sodium	0.267	Weak positive association
pH – TDS	0.611	Moderate positive association

The strongest relationship is between **TDS and chloride**: locations with higher chloride also have higher TDS in these five observations. Hardness is more closely associated with calcium than magnesium in this dataset. These are descriptive correlations only; with just five samples, they are sensitive to individual location and do not establish cause.

Location and Observation:

- Khasbag Gully has the highest TDS (1,310), hardness (750), alkalinity (523), and chloride (522). It is the most elevated sample across several measured parameters.
- Mujawar Gully has the second-highest TDS (1,200), hardness (478), and chloride (447).

Sopel Nagar has the lowest pH (6.46); Khasbag Gully has the highest pH (7.62).

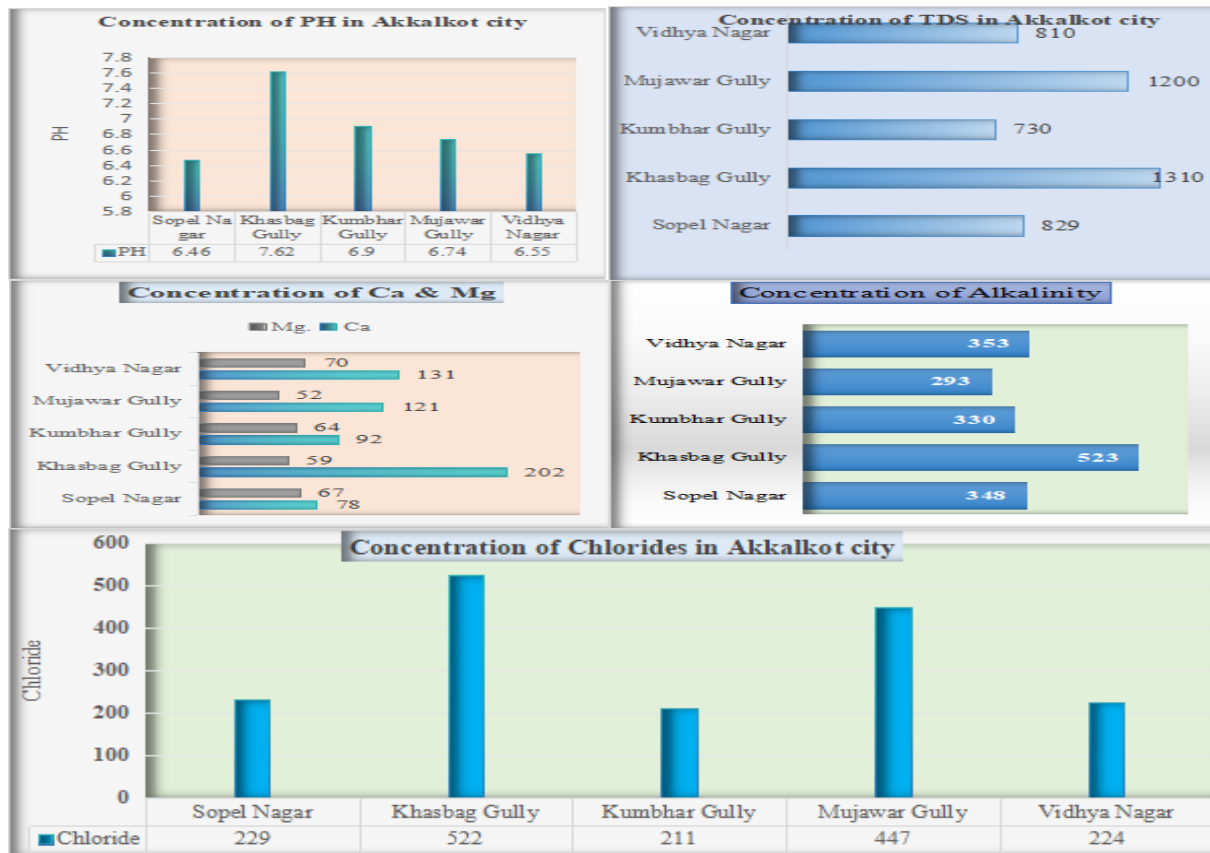
- Vidhya Nagar has the highest calcium (131) and magnesium (70), but its hardness is relatively low (198). This mismatch may warrant checking the analytical methods, units, or data transcription.

Overall interpretation

TDS, hardness, and chloride vary substantially across locations, with Khasbag Gully and Mujawar Gully standing out as comparatively high. The pH values range from 6.46 to 7.62. These results alone cannot determine

potability: confirm units and methods, compare the results with the applicable drinking-water standards, and test microbiological quality and other relevant chemical parameters.

GRAPHICAL REPRESENTATION OF GEO-CHEMICAL OF WATER



Total hardness is an important parameter of water quality. Calcium and Magnesium are the, principle cations responsible for hardness in present study values of Total hardness varied in between 198 to 750 Mg/L. These result exceed the limit set by WHO (150 Mg/L) and ISI (300 Mg/L) Thus the water is very hard water and not suitable for drinking and domestic purposes.

Similarly calcium and Magnesium are found between 78-260 Mg/L and 26-65 Mg/l. respectively. Highest concentration of these cations recorded at Jakekur. The concentration of sodium was found in the range from 87 to 230 Mg/L. The maximum permissible limit of sodium in drinking water is 175 Mg/L

The value of alkalinity in ground water is varied between 281 to 523 ppm/l. High saline ground water were recorded in wells located near to Gunjoti. The value of chlorides is observed between 117 to 522 ppm. The permissible limit of chloride in drinking water is 250 ppm (WHO, 1984). Highest concentration of chloride is found in Gunjoti (522 ppm) village.

VI.Overall conclusion:

TDS, hardness, and chloride vary substantially across locations, with Khasbag Gully and Mujawar Gully standing out as comparatively high. The pH values range from 6.46 to 7.62. These results alone cannot determine potability: confirm units and methods, compare the results with the applicable drinking-water standards, and test microbiological quality and other relevant chemical parameters.

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