

Physico-Chemical Characteristics of Ground Water in Rahuri Tahsil of Ahmednagar District, M.S., India

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Abstract: The Physico-chemical study of ground water from downstream area of Pravara River in Rahuri taluka reveals that, the quality of ground water in the study area is not same at different sampling stations. The main reason behind this variation may be the variation in geographical conditions and anthropogenic activities. The study reveals that, in general, the ground water available in rahuri is moderately benign in irrigation. It is suggest that, quality of ground water should be improve slightly and maintained properly. The present study may prove to be of some help in understanding the quality of ground water resources of the study area.

Keywords: Ground water, Quality, Characteristics, Physico-chemical, Parameters.

I. INTRODUCTION

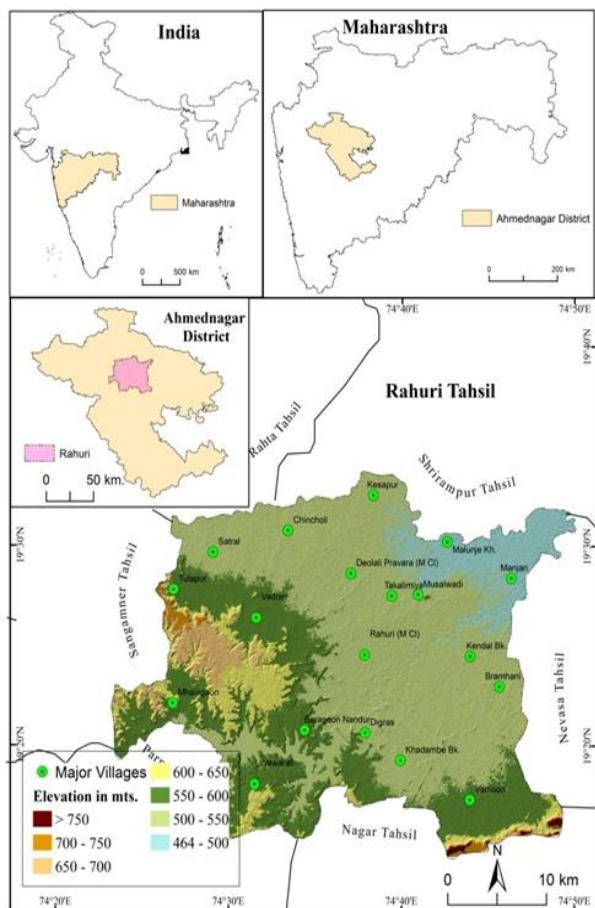
Water is vital natural resource, supporting life and environment that we has constantly supposed to be available in profusion and gift of nature (Kjellen, M., et al. 2000). It has been severely affect by rapid economic development and intensified human activities. (Nickson et al. 2005). The utilization of ground water for domestic, industrial and irrigation purpose has been constantly increasing particularly, where perennial surface water sources are scarce. (Mathussalam A. et. al. 2004). The most important source of water is rainfall which increases the level of wells. Geology is an important factor in water level^[7,8]. There are natural and man-made causes of water pollution, of which man-made causes are the most dangerous. Agriculture is considered an important factor for well water pollution as large quantities of chemical fertilizers and sprays are used for agriculture which affects water quality^[4,5]. There are two types of resource, one is natural resource and other is man-made resource. Natural resource includes various elements such as soil, water, vegetation etc. while human resource includes human quality, skill, and knowledge^[14,15]. As a result, human beings have made their own and economic progress on the strength of their intellect, but we have seen an increase in pollution^[16,17,19].

Today, the groundwater contamination is widely taking place because of either natural reasons or human actions. Thus, it requires a regular monitoring of water quality to device ways and means to maintain it. The ground water important sources of water being use for irrigation in the Rahuri tahsil where, sugarcane is the main cash crop. The

practice of over irrigation, use of pesticides, weedicides, chemical fertilizers and discharge of industrial effluent may affect the groundwater quality^[6]. Thus, this communication describes a systematic study on Physico-chemical characteristics of ground water from downstream area of Pravara River in Rahuri tahsil of Ahmednagar district in Maharashtra, India.

II. STUDY AREA

Rahuri tahsil is centrally located in the scarcity zone of Ahmednagar district in Maharashtra. Geographically, it is lengthy from 19° 15' 00" N to 19° 34' 00" N latitude and 74° 23' 30" E to 74° 50' 00" E longitude and is divided into the basins of river Mula and Pravara. Distribution of rainfall in the tahsil is uneven where and average rainfall about 520 mm. The tahsil receives its most of the rain during southwest monsoon season. Here, the maximum temperature ranges from 28°C to 41°C and sometimes raises up to 45°C in summer season. Minimum temperatures range between 7°C to 22°C while coolest climatic conditions prevail in winter. The total geographical area of the tahsil is about 92,867 hectares. Out of which 29,045 hectares area (31.28%) is under irrigation. The tahsil comprises of 95 villages and 2 urban centers viz. Rahuri and Deolali-Pravara. Canal, dug wells, and bore wells are the important modes of irrigation being use in the tahsil.



Map no 01: Location Map

OBJECTIVES

The main objectives of the present study the Physico-chemical Characteristics of Ground Water in Rahuri Tahsil.

1. To find out the Physico-chemical characteristics of ground water.
2. To recognize the ground water quality for irrigation.

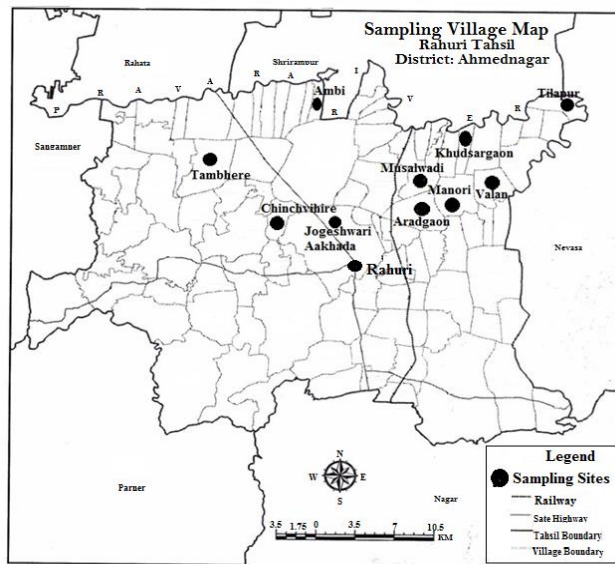
III. DATA SOURCES AND METHODOLOGY

Primary and secondary information has been used for this research paper. Eleven villages have been selected mainly for fieldwork and sampling collection in the primary information and samples have been taken from one well in these 11 villages. These experiments have been checked in the laboratory. Also the information in the secondary data form is collected from the research article and reference book. Also cartography methods are used to convert numerical information into qualitative information in which mainly bar graph are drawn. GIS software has also been used to create the maps and GPS has been used to capture the sampling location.

MATERIAL AND METHODS

Ground water samples were collect from randomly selected eleven dug wells in Rahuri tahsil, each from the area of a separate village, located in downstream area of river Pravara (Map 1). Water samples were collected from

eleven villages according to eleven villages Ambi, Aradgaon, Chinchvihire, Jogeshwari-Aakhada, Khudsargaon, Manori, Musalwadi, Rahuri, Tambhere, Tilapur, Valan. The water collection is for the period June 2020.



MAP: 1. SAMPLING VILLAGES

Samples collected during monsoon, 2014, in sterilized plastic bottles were brought to the laboratory and the studied Physico-chemical parameters. Unstable parameters viz. pH, Electrical Conductivity (EC) and Temperature were measurement in site. Carbonate (CO₃²⁻), Bicarbonate (HCO₃⁻), Chloride (Cl⁻), Magnesium (Mg⁺⁺), Calcium (Ca⁺⁺), sodium (Na⁺) and Potassium (K⁺) were analyzed by applying standard methods. Further, the basic statistical analysis was carried out for different physico-chemical parameters.

IV. RESULTS AND DISCUSSION

The temperature of ground water samples collected from different wells is found in a range of 28.2⁰ C and 31.9⁰ C. The maximum temperature was observe at Aradgaon, while minimum temperature was record at Musalwadi. The pH values were varies from 7.00 to 7.6, indicating alkaline nature of ground water in the study area. The maximum pH was observed at Aradgaon, Manori, Musalwadi and Tilapur while, the minimum of it was recorded at Chinchvihire and Tambhere. The electrical conductivity was found between 1.2 and 11.7 mm. The maximum value of it was recorded at Chinchvihire and the minimum at Aradgaon. It is noteworthy that, not a single site of sampling has reported the presence of carbonate. The values of bicarbonate were observed between 1.6 and 6.5 meq/lit. The maximum value was recorded at Manori and the minimum was recorded at Jogeshwari Aakhada and Rahuri. The values of chloride were found in the range of 3.2 and 47.6 meq/lit. The maximum value was recorded at Chinchvihire while the minimum of it was found at Jogeshwari Aakhada.

TABLE: 1 RESULTS OF GROUND WATER ANALYSES

Sr. No.	Name of Site	Temp	pH	EC	CO ₃ ²⁻	HCO ₃ ⁻	Cl ⁻	Ca ⁺⁺	Mg ⁺⁺	K ⁺	Na ⁺
1	Ambi	31.5	7.2	2.0	00	5.2	3.6	4.4	8.4	0.0387	1.14
2	Aradgaon	31.9	7.6	1.2	00	2.0	5.2	24.8	11.2	0.0151	3.2
3	Chinchvihire	29.6	7.0	11.7	00	2.0	47.6	19.2	68.8	0.0194	9.29
4	Jogeshwari-Aakhada	32.0	7.1	2.0	00	1.6	3.2	14.4	11.2	0.022	4.61
5	Khudsargaon	28.3	7.1	5.8	00	6.0	12.8	14.4	38.8	0.0376	6.42
6	Manori	30.5	7.6	1.8	00	6.5	10.1	14.0	26.0	0.0167	14.1
7	Musalwadi	28.2	7.6	2.1	00	2.0	30.8	1.6	10.0	0.0140	4.33
8	Rahuri	29.6	7.3	11.5	00	1.6	8.0	8.0	110.0	0.026	14.27
9	Tambhere	31.6	7.0	4.5	00	2.4	24.0	4.4	16.0	0.071	7.51
10	Tilapur	31.6	7.6	1.9	00	2.4	25.6	2.4	60.2	0.351	0.21
11	Valan	29.6	7.5	8.2	00	2.0	18.8	12.8	63.2	0.0296	7.01

Notes: All parameters are expressed in meq/lit except temp., pH and EC (mmhos).

The calcium values were in a range of 1.6 (Musalwadi) and 24.8 meq/lit (Aradgaon). The values of magnesium were recorded between 8.4 and 110 meq/lit. At Ambi and Rahuri respectively. The Potassium values were in the range of 0.0140 and 0.351 meq/lit. The maximum value was recorded at Tilapur while, minimum was found at Musalwadi. The range of Sodium was observed from 0.21 to 14.27 meq/lit at Tilapur and Rahuri respectively (Table 1). The village wise concentration of chemical parameters is depicted in Figure 1.

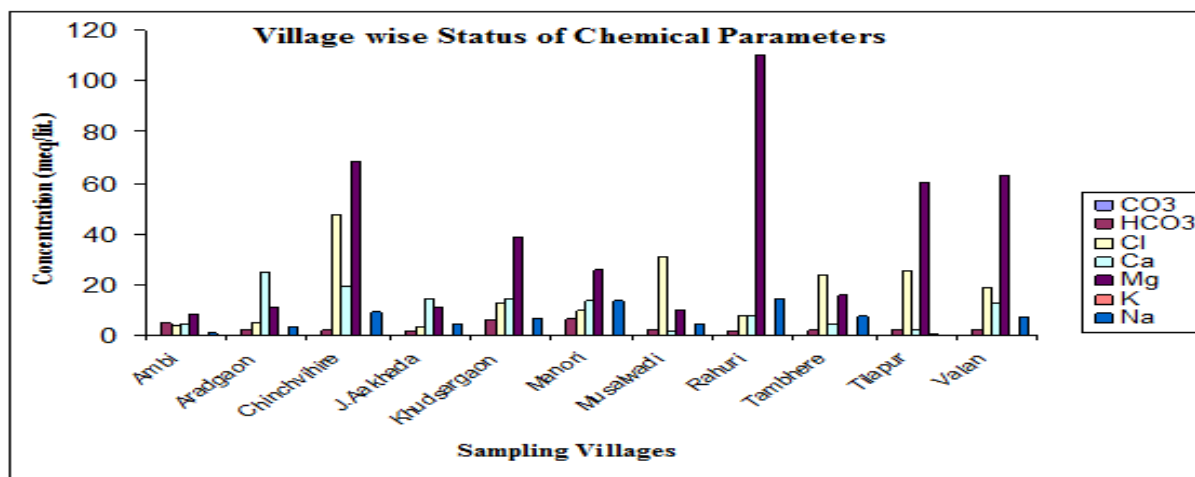


FIGURE: 1. GRAPHICAL PRESENTATION OF CHEMICAL PARAMETERS.

STATISTICAL ANALYSIS

The statistical analysis has been carried out for different parameters of ground water and the results are depicted in table 2, which shows the values of minimum, maximum, range, and mean, Standard Deviation, Standard Error and Coefficient of Variation for all the obtained parameters.

TABLE: 2 STATISTICAL ANALYSES OF PHYSICO-CHEMICAL PARAMETERS

Sr. No.	Parameter	Min.	Max.	Range	Mean	SD	SE	CV%
1	Temp	28.2	31.9	3.7	30.40	±1.42	0.43	4.67
2	pH	7.0	7.6	0.6	7.32	±0.26	0.08	5.55
3	EC	1.2	11.7	10.5	4.79	±3.98	1.20	83.09
4	CO ₃ ²⁻	00	00	00	00	±00	00	00
5	HCO ₃ ⁻	1.6	6.5	4.9	3.06	±1.86	0.56	60.78
6	Cl ⁻	3.2	47.6	44.4	17.25	±13.81	4.16	80.05
7	Ca ⁺⁺	1.6	24.8	23.2	10.95	±7.43	2.23	67.85
8	Mg ⁺⁺	8.4	110.0	101.6	38.53	±33.14	9.98	86.00
9	K ⁺	0.0140	0.351	0.337	0.06	±0.09	0.03	150.00
10	Na ⁺	0.21	14.27	14.06	6.55	±4.63	1.39	70.68

WATER QUALITY

The suitability of ground water for irrigation depends on the amount of salts present in it. High or little amount of salts present in the water to be used for irrigation thus, decide the water quality.

TABLE 3. GROUND WATER QUALITY INDICES FOR IRRIGATION PURPOSE IN STUDY AREA.

Site No.	Site	SAR	RSC	KR	SSP
1	Ambi	0.45	-7.6	0.09	8.0
2	Aradgaon	0.75	-34.0	0.09	8.0
3	Chinchvihire	1.40	-86.0	0.11	10.0
4	Jogeshwari-Aakhada	1.29	-24.0	0.18	15.0
5	Khudsargaon	1.24	-47.2	0.12	11.0
6	Manori	3.15	-33.5	0.35	26.0
7	Musalwadi	1.80	-9.6	0.37	73.0
8	Rahuri	1.86	-116.4	0.12	10.0
9	Tambhere	2.35	-18.0	0.37	27.0
10	Tilapur	0.04	-60.2	0.01	1.0
11	Valan	1.14	-74.0	0.09	8.0

The concentrations of these salts and their ratios were obtained by using water quality indices viz. Sodium Absorption Ratio (SAR), Residual Sodium Carbonate (RSC), Kelly's Ratio (KR) and Soluble Sodium Percentage (SSP). The obtained values are presented in Table 3. It is clear from, the ground water quality is moderately safe (USDA, 1954) for irrigating the crops.

FUTURE SCOPE FOR RESEARCH

The present work confines itself to the study of only ten Physico-chemical parameters of ground water quality. However, it is essential to carry out the in depth study of quality parameters of ground water to be used for irrigation in the study area.

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V. CONCLUSION

Based on Physico-chemical analyses, it is determined that, the ground water quality in the study area is moderately safe for irrigation purpose (USDA, 1954) in general and it varies from village to village. This qualitative variation in ground water may be the result of variation in geographical background, unplanned disposal of sewage and industrial effluent etc. Thus, it is suggested that, the ground water in the study area should be analysed before using it for irrigation. Though, presently the problem of ground water contamination is not much alarming, it may worsen in future. Thus, the quality of ground water in the study area should be improved slightly and maintained properly.

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