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Suitability of Ground Water for Irrigation Purpose in Veadasandur Block, Dindugal District

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ABSTRACT

A experimental studies was conducted to assess the quality of ground water in Veadasandur by find out the various Chemical parameters like pH, EC, Ca, Mg, Na, K. A water samples are collected near the tannery effluent disposal and the results are comparison with IS 10500 shows that the water is nearly suitable for Irrigation purpose by using SAR relationship, Percentage of Sodium in ground water.

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INTRODUCTION

Absence of water in the earth is very difficult to imagine. Groundwater is an important source of water in the present situation. It plays a virtual role in the environments. the degradation of quality of ground water due to disposal of human being activities and also the nature of soil (N.S.Magesh,S.Krishnakumar). The water is continuously getting polluted from many other sources. Growth of the cities and urbanization has not planned due to the migration of the village peoples into township areas (Ramachandra,Bharath,Aithal). The growth of tannery industries in India is rapid. Due to effluent disposal from the tannery industries is continuously polluting the groundwater and natural environmental in all over the India as well as in worldwide (N.C.Mondal). The characterization of the tannery waste is strong in colour, high BOD, more alkaline in nature and the concentration of the dissolved solids is very high. It's very difficult to pollute the ground water source but if once the ground water is polluted its really very complicated to bring to its original position. The contamination of ground water quality causes the major problem in human being health and Its not suitable for irrigation purpose. They need a some more special treatment methods to treat the groundwater (J.Colins,M.CSashik kumar). Effective methods to interpret the quality of water using Piper Diagram, Durov Diagram.the Piper Diagram and Durov Diagrams are similarly analyses the amount of anion and cation present in water and plotted on separate anion and cation triangles.

II. Study Area:

80 tannery units and 50 leather units are present in the Dindugal District. dindigul is one of the most important places for its tannery units in Tamilnadu(Mohamed Hanipha,Zahir hussian). it is bounded on the north by Erode and Karur districts, on the south by Teni and Madurai districts on the east by Coimbatore district and on the west by Tiruchchirapalli district. It lies between $10^{o}13'44"$-$10^{o}26'47"$N latitude and $77^{o}53'08"$- $78^{o}01'24"$E longitude. It covers an area of about 240 km^2. in this district there is no other existing perennial streams. the total run off from the precipitation within the basin ends in Kodaganar River(N.C.Mondal,V.S.Singh). The annual rain fall data's were collected from the PWD is 915.5mm in the year of 1971-2001. It's consisting of black cotton soil and dark red sandy soil. The source of the ground water in the study area is extracted through the bore well for different purpose.

III. Methodology:

Groundwater samples were collected from 20 locations from Veadasandur block in Dindigul district. The collected water samples were transferred into the plastic water bottle to carry out the chemicals parameter of water samples. The basic and major ions concentration of the water samples collected from the different locations by using standard procedures recommended by APHA-1994

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(C.Sadashivaiah, C.R.Ramakrishnaiah and G.Ranganna). The results from the analysis were used to classify the water is suitable or unfit for drinking purpose and domestic purposes. Sodium Adsorption Ratio (**SAR**) is a measure of the suitability of water for use in agricultural irrigation, as determined by the concentrations of solids dissolved in the water. The value of SAR are found to be less than 10 is excellent for irrigation, the value of SAR between the 10 to 18 is good for irrigation, the range between 18 to 26 is doubtful for irrigation and the value exceed the 26 is unfit for irrigation purpose.

$$SAR = \frac{Na}{\sqrt[2]{(Ca+Mg)/2}}$$

To classify the water samples are suitable for irrigation purpose by using to found out the percentage of sodium ions present in ground water (C.Sadashivaiah, C.R.Ramakrishnaiah and G.Ranganna). To determine the percentage of sodium ion in water by using the following formula.

$$\% Na = \frac{Na}{(Ca+Mg+Na+K)} \times 100$$

RESULT AND DISCUSSION

The analysis of ground water samples are collected from the selected location of Veadasandur block in Dindigul district is shown in Table 3.

4.1.Ph:

pH is important factor to determine the nature of ground water is acidic or alkaline. The pH value of all groundwater samples collected from selected location in Dindigul district are found to be in the range of 7.22 to 8.17(Table.1). The highest value of 8.17 is found at location Marambadi whereas lowest value of 7.22 is observed at location Kovilur. The maximum permissible limit of pH for drinking and irrigation purpose is 7.0-8.5(WHO). The Groundwater samples are found to be within the acceptable limit as per WHO. There is no abnormal change of pH in the groundwater samples. If the pH is found beyond the permissible limit.

4.2.Calcium (Ca):

Calcium is one of the major nutritional element for human being and to maintain the structure of plant cells and soils. in this investigation, to estimated calcium values are recorded range between 48 to 209 ppm. In the study area 95% of the samples, the calcium values are found within the maximum permissible limits as per WHO. The value of calcium is slightly higher than permissible limit at location Nagarampatti due to the cationic ion exchanges with presence of sodium ions in that study area.

4.3.Magnesium (Mg):

The concentration of magnesium ions are recorded between 10–143 ppm for the groundwater samples. Maximum permissible value of magnesium is 30 ppm and it may be extended up to 100 ppm. The highest value of magnesium is recorded in the location of Nathapatti and the lowest values of observed at Thattarapatti. Due to the leachate from the effluent in tannery industries are affect the magnesium concentration in study area and magnesium generally occurs in lesser concentration than calcium because of dissolution of magnesium rich minerals is slow process.+

4.4.Sodium (Na):

In naturally occurring elements in groundwater are sodium and potassium. These two important elements are directly added into groundwater from the tannery industries and domestic waste disposal from surrounding areas (Chari K.V.R and Lavanya M.G). The maximum permissible limit for sodium ions in water is 200 ppm as per WHO. The range of magnesium ions from the study area lies between 62-525ppm. The highest values of sodium is recorded at Vellampatti and the lowest value of magnesium ion in study area is Pudipuram.high concentration of sodium ions cause the heart attack and other heart problem in human being and unfit for irrigation purpose.

4.5.Potassium (K):

In nature the Dindigul district has an igneous and metamorphic type of rocks and the disposal of effluent from the tannery industries are affect the potassium concentration in the study area. The potassium values for the groundwater samples are recorded in the range between 12-90ppm. The highest value and lowest value of potassium estimated with receptively from the Kuduppam and Usilampatti location.

4.6.Sodium Absorption Ratio (SAR):

The classification of groundwater samples for irrigation purpose from the study area with respect to SAR is presented in Table 1. Twenty two samples are collected from the study area. The 60% of the samples are suitable for irrigation purpose and remaining 40% of the locations are unfit for irrigation purpose due to nature of the rock and disposal of effluent, domestic waste in study area.

Table 1: SAR Values for groundwater samples in the study area.

S.No	SAR Values	Remarks on Quality	No. of Samples
1	Less than 10	Excellent	1
2	10 to 18	Good	12
3	18 to 26	Doubtful	6
4	Greater then 26	Unsuitable	3

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4.7.Percentage of Sodium (%Na):

The classification of groundwater with respect to percentage of sodium is given in the Table 2. From the 22 samples collected in Veadasandur block in Dindigul district. The concentration of % sodium in ground water is important factor to analyze the water is suitability for irrigation purpose. In the analysis the samples 95% is suitable for irrigation and Vellampatti location is doubtful for irrigation purpose due to disposal of effluent from industries and nature of rock in Dindigul district.

Table 2: Sodium Percentage Water Class.

S.No	% Sodium	Remarks on Quality	No. of Samples
1	<20	Excellent	0
2	20 to 40	Good	6
3	40 to 60	Permissible	15
4	60 to 80	Doubtful	1
5	>80	Unsuitable	0

Table 3: Chemicals Parameters for different Location in Veadasandur Block In Dindigul District.

S.No	Sample	Sample Station	WATER TYPE	pH	CA	MG	NA	K
					(ppm)			
1	S_1	Kulanthupatti	Bore Well	7.34	56	43	82	24
2	S_2	Kovilur	Bore Well	7.22	134	123	215	45
3	S_3	Usilampatti	Bore Well	8.16	48	28	76	12
4	S_4	E.chitoor	Bore Well	7.49	56	41	84	14
5	S_5	Nagarampatti	Bore Well	7.85	209	135	245	61
6	S_6	Ammapatti	Bore Well	7.69	135	103	192	64
7	S_7	Kuduppam	Bore Well	7.59	108	54	141	90
8	S_8	Kuttam	Bore Well	8.15	96	76	134	12
9	S_9	Kovakkapatti	Bore Well	8.09	99	82	165	57
10	S_{10}	Marambadi	Bore Well	8.17	102	82	197	66
11	S_{11}	Nagaiya kotta	Bore Well	7.4	75	41	114	38
12	S_{12}	V.pudukottai	Bore Well	7.22	179	36	189	47
13	S_{13}	Sri ramapuram	Bore Well	8.13	72	36	124	35
14	S_{14}	Nalla munnar	Bore Well	7.39	143	105	174	65
15	S_{15}	Vellampatti	Bore Well	7.47	127	96	525	68
16	S_{16}	Palampatti	Bore Well	7.8	119	72	278	52
17	S_{17}	Pudi puram	Bore Well	8.06	48	36	62	12
18	S_{18}	Thattara patti	Bore Well	8.03	143	10	178	36
19	S_{19}	Virudalaipatti	Bore Well	7.91	64	35	95	24
20	S_{20}	Malavarapatti	Bore Well	7.56	139	69	196	44
21	S_{21}	Kalyarpatti	Bore Well	8.09	179	21	265	67
22	S_{22}	Nathapatti	Bore Well	7.77	159	143	214	53

V.Conclusion:

Chemical characterization of groundwater is taken from Veadasandur block in Dindigul district. Around 22 samples were collected from different location in Veadasandur and analyzed for pH,Ca,Mg,Na,K using standard procedure. Most of samples locations were found within the permissible limits as per WHO and IS 10500. The result from SAR standards three samples are exceeds the permissible limit and based on the percentage sodium interpretation one sample is doubtful for irrigation purpose. Particularly Vellampatti location is unsuitable for Irrigation purpose in both interpretations due to lechate of effluents from tannery industries. From this analyse and interpretation Vellampatti locations need a some treatment unit to treat the groundwater for domestic and irrigation purpose.

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