

Contamination of groundwater in Jadavalli village in Guntur district of A.P.

Groundwater quality in jadavalli village

R. Venkata Ramana*, Dr. P. V. Nageswara Rao**

Research scholar*, Department of Geology*

Acharya Nagarjuna University and *

Assistant Professor*, VFSTR University*

Assistant Professor**, Department of Geology**

Acharya Nagarjuna University**

Guntur, India**

e-mail: rvrmana_62@yahoo.com*, drpvn.rao@gmail.com**

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GRAPHICAL ABSTRACT

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A detailed study has been conducted to assess the ground water quality in Jadavalli village in Ponnur mandal of Guntur district, Andhra Pradesh. The study area contains clay and sand of Recent age. Groundwater occurs under unconfined condition. The groundwater is analyzed for various physico-chemical parameters. Values of most of these parameters indicate that the groundwater is not suitable for drinking water. The values of RSC and SAR methods indicate that the groundwater is not suitable for irrigation purpose. In this paper an attempt is made to understand the geochemical processes controlling the groundwater quality. Suitable precautionary measures are suggested for improving groundwater quality in the study area.

Keywords— Contamination, Jadavalli, SAR method, Guntur district

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I. INTRODUCTION

The necessity of groundwater increases enormously both in rural and urban areas throughout the world. At the same time the maintenance and management of groundwater quality is needed for both economical development and environmental aspect of an area. The contamination of water may be due to marine transgression and regression along coastal zone, fertilizers used for irrigation, evaporation and anthropologies etc., as in [1],[2],[3],[4],[5],[6],[7],[8]. Literature suggests that little work on this aspect has so far been done in India as in [9], [10],[11],[12],[13],[14],[15],[16].

II. STUDY AREA

A. Location

The study area is located south of Ponnur and lies in between East longitude 16.03183° and North latitude 80.57509 as shown in map enclosed (Fig.1). The Jadavalli village is situated east side of the Tungabhadra drain.

B. Physiography

The area is plain and has gentle slope towards the Bay of Bengal. Small patches of the drainage pattern have been developed as irrigation channels and drains. The study area contains 95% cultivated land, 4% domestic land and 1% waste land.

C. Hydrogeology

The area is covered by clay, sand and silt of Recent age. The study area comprises of permeable coarse to medium sands around the village of Jadavalli. The permeable sandy deposits occur down to a depth range of 12 to 25m, underlain by thick clay in which the quality of ground water is saline. Fresh ground water occurs in sandy aquifer and is under unconfined conditions as in [17]. Ground water is extracted by means of shallow filter points for irrigation purpose. The depth to water level varies from 2.9 to 3.7m below ground level.

III. QUALITY STUDIES

It is observed during the preliminary hydro geological investigations carried out in Jadavalli that in the recent past, quality of ground water has deteriorated significantly. This feature is more observed in the areas nearer to Tungabhadra drain. Keeping in view of this quality problem in this area, chemical analysis data of ground water samples for the years 1973, and the average values of four ground water samples collected in various directions from Jadavalli village during post monsoon, November-2016 and Pre monsoon, May-2016 is considered and compared as in [18]. The data is presented in the table I below.

TABLE I: Showing the chemical analysis of ground water samples in Jadavalli village in Guntur district (in meq/l)

Chemical Parameter	Jadavalli village	
	1973	Premonsoon 2016
pH	7.64	8.23
E.C (micro siemens/cm)	1.94	2.63
CO ₃ ⁻ (meq/l)	0.65	2.49
HCO ₃ ⁻	8.87	6.43
Cl ⁻	8.36	17.94
SO ₄ ²⁻	4.04	7.02
Ca ²⁺	3.52	2.37
Mg ²⁺	3.68	3.16
Na ⁺	13.80	43.54
K ⁺	0.13	0.27
RSC	1.32	3.39
SAR	7.27	26.18

Chemical Parameter	Jadavalli village	
	1973	Post monsoon 2016
pH	7.64	8.53
E.C (micro siemens/cm)	1.94	2.73
CO ₃ ⁻ (meq/l)	0.65	2.64
HCO ₃ ⁻	8.87	6.52
Cl ⁻	8.36	14.42
SO ₄ ²⁻	4.04	7.39
Ca ²⁺	3.52	2.15
Mg ²⁺	3.68	3.33
Na ⁺	13.80	45.93
K ⁺	0.13	0.72
RSC	1.32	3.68
SAR	7.27	27.75

TABLE II: Classification of groundwater samples based on values of RSC and SAR .

Parameter	Range	Category
SAR	<10	Excellent
	10-18	Good
	18-26	Fair
	>26	Unsuitable
RSC	<1.25	Safe
	1.25- 2.5	Suitable
	>2.5	Unsuitable

It is observed from table-I that the RSC value of ground water in Jadavalli area is 1.32 in 1973 and ranges from around 3.39 to 3.68 during pre monsoon, May-2016 and Post monsoon, November-2016 respectively. The RSC value more than 2.5 indicates the injuriously contaminated ground water with sea water. Accordingly the value is 1.32 in Jadavalli village during the year 1973 indicates that there is no contamination of ground water during that period. The value in Jadavalli village ranges from 3.39 to 3.68 in pre monsoon, May-2016 and in the post monsoon, November-2016 respectively indicating the injuriously contamination of ground water which is not suitable for irrigation purpose as per table II.

It is also observed from table-I that the SAR value of ground water in Jadavalli area is 7.27 in 1973 and ranges from around 26.18 to 27.75 during pre monsoon, May-2016 and Post monsoon, November-2016 respectively. The RSC value more than 2.5 indicates the injuriously contaminated ground water with sea water. Accordingly the value is 7.27 in Jadavalli village during the year 1973 indicates that there is no contamination of ground water during that period. The value in Jadavalli village ranges from 26.18 to 27.75 in pre monsoon, May-2016 and in the post monsoon, November-2016 respectively indicating the injuriously contamination of ground water which not suitable for irrigation purpose as per table II.

The quality deterioration of ground water in the area may be due to increasing in ground water development through filter points and subsequently ingress of back waters from

Tungabhadra drain. The number of filter points increased to 420 in Jadavalli area.

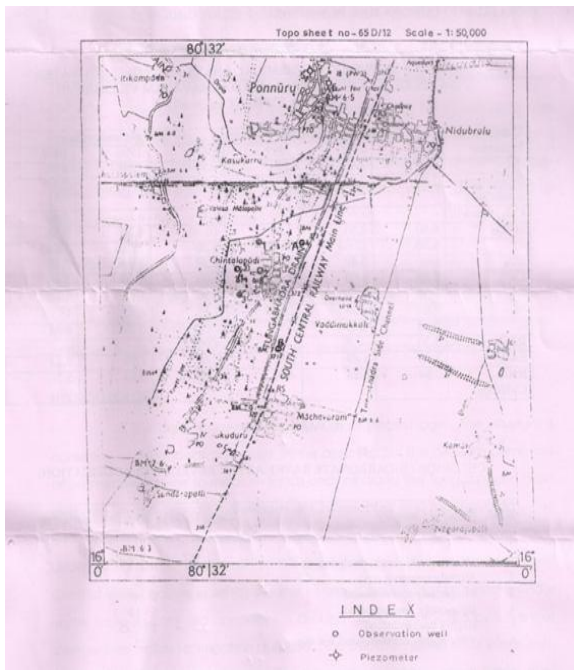


Fig. 1: Location Map of Jadavalli Village of Ponnur Mandal in Guntur District

IV. CONCLUSION

It is concluded that in the village of Jadavalli closer to the Tungabhadra drain show deterioration of ground water quality due to the ingress of back water from Tungabhadra drain, fertilizers used for irrigation, evaporation and anthropologies and over exploitation of groundwater through filter points for irrigation purpose. The following measures should be adopted to prevent deterioration of ground water quality in the area. Exploitation of ground water should be controlled and monitored regularly. Artificial recharge wells and ponds should be constructed in the contaminated area. The ground water department should be monitored and maintain the quality of ground water by providing observation wells in the study area.

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