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Assessment of Groundwater quality in Western Part of Krishna river in Andhra Pradesh

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ABSTRACT

Necessity and dependency of groundwater for various purposes are increasing day by day. Severe drought conditions prevailed sometimes in the past, insufficient availability of surface water, increasing demand of water for different uses such as irrigation etc., lead to depend on exploitation of groundwater. At the same time maintenance of groundwater quality also becomes necessary as it leads to ill- health of living beings in that area and decrease in agricultural production. So assessment of groundwater quality is carried out in Komali region of Krishna delta part of Andhra Pradesh state of India. The region contains subsurface formations of recent era. Water table in the study region available in unconfined to semi confined conditions. Groundwater samples are tested for different chemical parameters. Values of these analytical samples indicate that the values are not lying with in the standard limits for drinking water. The values of RSC and SAR methods indicate that the groundwater is not suitable for irrigation purpose. Thus some of the geochemical observations which govern its quality in this region are presented in this paper. Proper remedial measures are proposed for improvement of its quality to maintain the environmental balance in this area.

KEYWORDS

Hydrogeology, Groundwater Quality, Komali, Andhra Pradesh, Krishna Delta.

Introduction

The necessity of groundwater increasing 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 (Karanth,1997, Venkata Ramana, 2019, Venkata Ramana, 2020), festilizers used for irrigation etc., (Alfred P. Bernhart, 1976, APHA,1998, Deutsch,1997, Raghunath, 1967, USPHS, 1962, USSLS, 1954, Wilcox, 1967). Literature suggests that little work on this aspect has so far been done in India (Ramana, 2018, Venkata Ramana, 2019).

Location: The study area is located south of Ponnur and lies in between East latitude 16.5651° and North longitude 79.8843^0 as shown in map enclosed (fig1). The Komali village is situated east side of the Tungabhadra drain.

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.

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 Komali. The permeable sandy deposits occur down to a depth range of 12 to 25m, underlained by thick clay in which the quality of ground water is saline. Fresh ground water occurs in sandy aquifer all along paleo channels and is under unconfined conditions (CGWB report). 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. The thickness of alluvium sands range from 10 to 27m.

Quality Studies

It is observed during the preliminary hydro geological investigations carried out in Komali that in the recent past,

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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 1976, and the average values of four ground water samples collected in various directions from Komali village during post monsoon, November-2020 and Pre monsoon, May-2020 is considered and compared (APSGWB,1976). The data is presented in the table1 below.

Table 1: Showing the Analysis of Ground Water Samples in Komali Village (in meq/l)

Chemical Parameter	Komali (Premonsoon)	
	1976	2020
pH	7.64	8.23
E.C (micro siemons/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	4.04	7.02
$Ca^{+2,}$	3.52	2.37
Mg	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	Komali (Post monsoon)	
	1976	2020
pH	7.64	8.53
E.C (micro siemons/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	4.04	7.39
$Ca^{+2,}$	3.52	2.15
Mg	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 2: 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-1 that the RSC value of ground water in Komali area is 1.32 in 1976 and ranges from around 3.39 to 3.68 during pre monsoon, May-2020 and Post monsoon, November-2020 respectively. The RSC value more than 2.5 indicates the injuriously contaminated ground water with sea water. Accordingly the value is 1.32 in Komali village during the year 1976 indicates that there is no contamination of ground water during that period. The RSC value in Komali village ranges from 3.39 to 3.68 in pre monsoon, May-2020 and in the post monsoon, November-2020 respectively indicating the injuriously contamination of ground water which not suitable for irrigation purpose as per table 2.

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It is also observed from table-1 that the SAR value of ground water in Komali area is 7.27 in 1976 and ranges from around 26.18 to 27.75 during pre monsoon, May-2020 and Post monsoon, November-2020 respectively. The SAR value more than 26 indicates the injuriously contaminated ground water with sea water. Accordingly the value is 7.27 in Komali village during the year 1976 indicates that there is no contamination of ground water during that period. The value in Komali village ranges from 26.18 to 27.75 in pre monsoon, May-2020 and in the post monsoon, November-2020 respectively indicating the injuriously contamination of ground water which not suitable for irrigation purpose as per table 2.

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 Komali area.

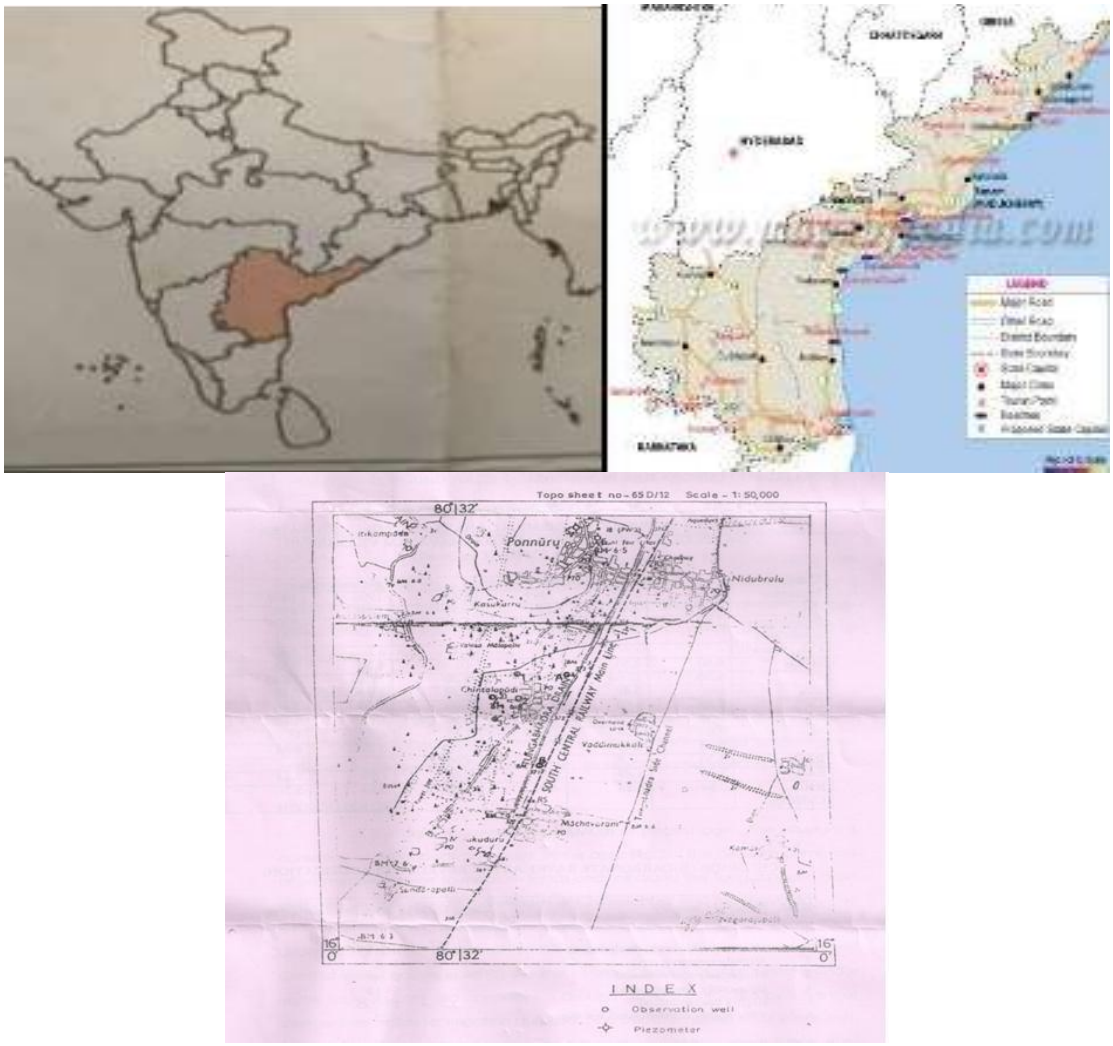

Figure 1. Location Map of Komali Village in Guntur District

Conclusion

It is concluded that in the village of Komali closer to the Tungabhadra drain show deterioration of ground water quality due to the ingress of back water from Tungabhadra drain 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

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wells and ponds should be constructed in the contaminated area. The ground water department should be monitor and maintain the quality of ground water by providing observation wells in the study area.

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