

Investigation on Groundwater Quality in parts of Ramdurg Taluk of Malaprabha River Command, Karnataka, India

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Abstract - Groundwater is the major component in the water resources system than surface water due to its wider availability and greater acceptability. However, in the recent years there are lot of hue and cry from all sections of the society because of increasing population, industries and agriculture intensity which resulted in the large scale contamination of both surface and groundwater. The situation is further aggravated particularly in command areas. In the command areas due to the excessive use of fertilizers and pesticides, the contamination is fast spreading to the adjoining areas. Therefore, it is necessary to understand the physical and chemical characteristics of groundwater with reference soil and underlying hydrogeological conditions. It is observed that many of the chemicals applied to farm land, however, move down with the deep percolating water from the root zone and contaminate the underlying ground water. Therefore, in the present study, laboratory investigations were carried out for monitoring the chemical constituents of groundwater in parts of Malaprabha command area falling Ramdurg taluk, Belagavi district, Karnataka

Key Words: Physiochemical characteristics, Laboratory analysis, ramdurga taluk.

1. INTRODUCTION

Water quality is the combination of properties that are demonstrated in relation to human, other living creatures, substances. The impact of water quality on soil and crops helps in selecting appropriate alternatives to manage with potential water quality related problems that might reduce production under existing conditions of land use. The desired water quality standards depend on the purpose of water use. One set of quality suitable for irrigation may not suitable for domestic use. Therefore, classification of water with reference to suitability is one of the important purposes of groundwater quality investigations. Today agriculture utilizes a variety of chemicals in plant production. A broad range of fertilizers, pesticides and fumigants are now routinely applied to agricultural lands, which makes the agricultural operations to be one of the most probable non-

point sources of pollution. In semiarid and arid regions toxic traces and salts are frequently found in consequence to excessive irrigation. The agricultural chemicals which are beneficial in surface soils later leach into deeper vadose zone and groundwater creating environment problems. Hence, the agricultural contaminants in root zone need to be managed and there is a necessity for prevention of their transport into nearby surface and groundwater.

2.Studyarea

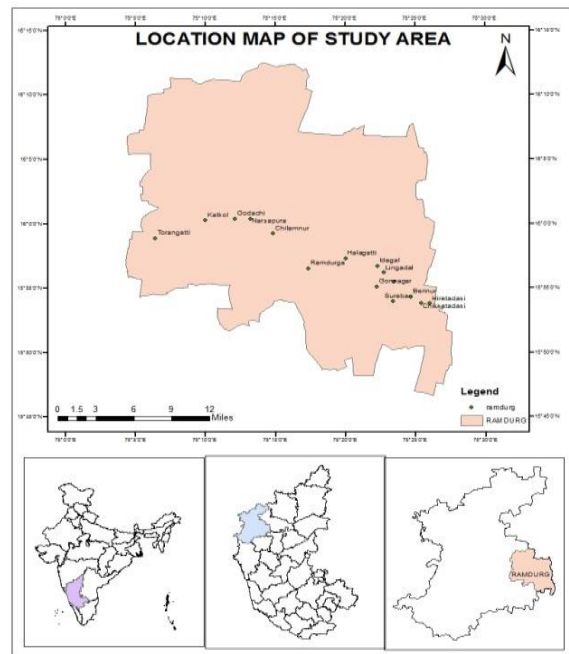


Fig-1: Location map of study area.

Study area is lying between 75° 5' 30" E - 75° 33' 0" E longitude and 15° 44' 0" N - 16° 0' 30" N latitude which consist of Ramdurg and Saundatti taluks in the state of Karnataka. Ramdurg is covering an area of approximately 600 ×10⁶m² and is situated at 15.95° N latitude and 75.3° E

longitude in Belgaum district. Annual rainfall of Ramdurg is varying from 221.3 to 836 mm/yas given by the reports from Central Ground Water Board (CGWB). Saundatti taluk covers an area of approximately $436 \times 10^6 m^2$ and is located at $15.78^\circ N$ latitude and $75.12^\circ E$ longitude. As indicated by the reports from CGWB, annual rainfall of Saundatti is varying from 224 to 894 mm. Three types of soil are present in the study area namely clayey, loamy and clayey skeletal. These soils are neutral to alkaline in reaction and are well supplied with bases. They are moderate to well drained soils with low permeability. However, the study area is dominated by clayey soil. The present study has been carried out in areas of Malaprabha command, which covers Ramdurga and parts of Saundatti taluk, from where nine samples were collected for detailed water quality analysis (Fig. 1.).

3. Methodology:

Laboratory analysis was performed on all the collected samples to determine water quality of the study area. Water quality parameters observed are for prior to irrigation and after irrigation. The soil and water samples were collected from villages of Ramdurg taluk as listed in following Table 1. Water quality analyses were carried out in the laboratory for various chemical constituents which are list below (Table 2). The type of equipment used is also indicated in the table.

Table 1. Water sampling locations of the study area

Sl. No	Name of village	Location			Type of soil	Source of water	Crop
		Latitude	Longitude	Altitude (m)			
1	Bennur	$15^\circ 54' 18.52''$	$75^\circ 24' 39.61''$	538	Black cotton	Borewell	Sugarcane
2	Chikkatadasi	$15^\circ 53' 48.43''$	$75^\circ 25' 23.08''$	541	Black cotton	Borewell	Maize, sugarcane
3	Godachi	$16^\circ 0' 21.01''$	$75^\circ 12' 5.89''$	595	Red	Borewell	Maize, wheat
4	Idagal	$15^\circ 56' 41.53''$	$75^\circ 22' 17.37''$	550	Red	Openwell	Groundnut
5	Katkol	$16^\circ 0' 14.09''$	$75^\circ 9' 58.97''$	607	Red	Borewell	Maize jowar
6	Lingadal	$15^\circ 56' 11.48''$	$75^\circ 22' 42.34''$	548	Black cotton	Borewell	Maize
7	Narsapura	$16^\circ 0' 19.79''$	$75^\circ 13' 11.02''$	591	Red soil	Borewell	Sunflower, Groundnut
8	Sureban	$15^\circ 53' 56.01''$	$75^\circ 23' 21.17''$	555	Blackcotton	Borewell	Maize, jowar
9	Torangatti	$15^\circ 58' 50.96''$	$75^\circ 6' 23.20''$	628	Blackcotton	Borewell	Sugarcane

Table 2. Parameters studied and method used

Sl No	Parameters	Methods	Equipments
1	pH	Electronic	pH Meter(HACH)
2	Electrical conductivity	Electrical	Conductivity meter(HACH)
3	Carbonate and Bicarbonate	Volumetric method	Bi-acidimetric titration method using phenolphthalein and methyl orange as indicator
4	Sulphate	Turbid metric method	Spectrophotometer –HACH DR2800
5	Chloride	Mohr's Titrimetric Method	Titration of 0.02N AgNO ₃ solution in presence of potassium chromate
6	Calcium	EDTA Titrimetric Method	EDTA titration using Potassium Dichromate
7	Magnesium	EDTA titrimetric method	EDTA titration using Ammonium perporate
8	Sodium	Flame emission	Flame Photometer
9	Potassium	Flame emission	Flame Photometer

4. Results and discussion

The groundwater quality characteristics of the study area are shown in Table 3. It is observed that the water is alkaline in all the locations and Electrical conductivity is above the permissible limits indicating water is relatively saline in majority of the locations. The concentration of nitrate is much higher than the permissible limits except in Bennur. However, it is observed that there is a significant concentration of Nitrate in the study area. The concentration of nitrate varies between 27.06 mg/l at Bennur to 68.6 mg/l at Godachi. Minimum concentration was observed at Bennur and Torangatti villages.

Table 3. Water quality parameters observed prior to irrigation in parts of Ramdurga Taluk in MalaprabhaCommand.

Sl No	Name of the village	pH	Electrical conduct. mhos/cm	CO ₃ mg/l	HCO ₃ mg/l	SO ₄ mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NO ₃ mg/l
1	Bennur	8.4	2000	0.6	4.7	0.5	11.8	0.3	7.1	4.8	7.15	27.06
2	Chikkatadasi	8.6	1000	1.2	5.9	0.4	4.7	0.3	6.0	4.1	6.55	57.6
3	Godachi	8.1	1000	0.1	4.3	3	3.9	1.8	1.7	8.0	3.0	68.6
4	Idagal	8.4	900	0.2	2.2	3.4	5.3	2.1	5.0	5.8	1.1	53.8
5	Katkol	8.8	1900	0.7	4.3	4.4	9.6	0.6	4.2	14.5	8.9	48.3
6	Lingadal	8.0	1700	0.2	2.3	6.9	9.5	2.2	9.5	9.6	6.6	57.1
7	Narsapur	8.3	800	0.3	2.2	0.8	2.7	0.7	2.7	3.2	3.7	49.9
8	Sureban	8.5	900	0.4	3.5	3.5	12.7	1.6	6.6	13.2	6.1	50.4
9	Torangatti	8.6	1860	0.9	5.8	1.8	4.6	2.1	4.5	9.86	6.7	32.4

Table 4 shows the groundwater quality parameters as observed after irrigation in the study area. The observed pH value varies between 7.9 and 8.7 after irrigation. Minimum is observed at Lingadal and maximum at Torangatti and

Godachi. The observed concentration of nitrate varies between 27.5 to 58.2 mg/l. Minimum value (7.9) is observed at Sureban and maximum (8.7) at Godachi. The potassium concentration is minimum at Idagal and maximum at Katkol. The highest sodium concentration is observed in Sureban and Katkol village.

The electrical conductivity which denotes the concentration of Total Dissolved Solids and salinity factors is found to vary between 0.7 and 2.54 ds/m. Maximum is observed at Katkol and minimum at Narsapur. The chloride content observed after irrigation varies from 2.7 to 12.7 mg/l. Minimum is noticed at Narsapur and maximum at Sureban. The minimum sulphate concentration is observed at Bennur and maximum at Lingadal. Concentration of calcium shows higher value in Lingadal and lower in Bennur and Chikkatadasi. Alkalinity in natural water is caused by the presence of carbonates, bicarbonates and hydroxides. A minimum of 0.1mg/l alkalinity is observed at Godachi, however maximum of 5.9mg/l alkalinity is observed at Chikkatadasi. The results of the investigation reveal that there is an intense and unregulated use of fertilizers and pesticides in various parts of the study area.

Table 4. Water quality parameters observed after irrigation in parts of Malaprabha Command area

Sl No	Locations	pH	Electrical Conductivity mmhos/cm	CO ₃ mg/l	HCO ₃ mg/l	SO ₄ mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NO ₃ mg/l
1	Bennur	8.3	2500	0.6	4.3	0.5	10.4	0.73	5.08	15.9	8.2	46.4
2	Chikkatadasi	8.3	780	0.21	2.68	1.64	1.5	1.3	1.3	4.4	3.3	48.4
3	Godachi	8.7	1060	0.15	3.61	2.7	3.4	1.58	1.4	6.6	3.1	58.1
4	Idagal	8.4	1050	0.18	1.99	2.9	4.5	2.1	2.9	5.0	3.9	40.5
5	Katkol	8.3	2540	0.5	4.8	5.2	11.1	1.8	4.6	16.1	7.7	46.4
6	Lingadal	7.9	1800	0.5	2.56	6.2	8.5	2.4	8.36	9.6	6.5	47.4
7	Narsapur	8.2	700	0.3	2.16	0.8	2.8	2.4	2.6	2.8	3.1	45.5
8	Sureban	8.4	1230	0.5	2.98	2.1	4.8	1.2	4.5	5.0	3.9	27.5
9	Torangatti	8.7	1630	0.8	6.17	1.5	3.8	1.27	3.5	8.06	2.8	29.8

5. Conclusion

Ground water quality is one of the major indicators to understand the extent of salinity in any hydrological regime. The canal release and cropping pattern plays a significant role in the variation of salinity from place to place in the study area. The ground water quality analysis of the selected locations indicates that the ground water is found to have relatively higher salinity. Farmers of the command area informed that the salinity was a major issue during the canal water supply period, however, presently; issue is resolved as the canal flow is restricted due to non-availability of surface water in the reservoir. The higher content of nitrate in the study area is a matter of concern and authorities are

required to address the situation immediately to treat the water if it is to be used for drinking purposes.

6. References:

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