

Ground Water Quality in Coimbatore, Tamil Nadu along Noyyal River

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The ground water quality in Coimbatore city along the Noyyal river during pre-monsoon and post - monsoon seasons in 2005 is discussed in this paper. Water samples were collected from 12 wells on either side of the river. The physico - chemical analysis of the collected samples was carried out for the parameters, such as pH, total dissolved solids (TDS), electrical conductivity (EC), total hardness (TH), alkalinity, calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride, sulphates (SO_4^{2-}) and sodium (Na^+). From the study, it is revealed that EC, Ca^{2+} , Mg^{2+} have high concentrations in pre- and post-monsoon seasons. In most of the places, the quality of water was not found suitable for irrigational and industrial activities because of high concentrations of electrical conductivity and total hardness. In general, the values of all the studied parameters were high and above the standards during the post-monsoon season, compared to the pre-monsoon season in 2005.

Key words : *Water quality, parameters, chemical analysis*

Introduction

Ground water was considered to be very clean and safe in past but nowadays it is getting polluted with rapid growth of urban and industrial activities, particularly in the developing countries, where proper waste disposal measures are not followed. Since the quality of public health depends to a greater extent on the quality of drinking water, it is incumbent that detailed information about the quality of water be systematically collected and monitored. In many ground water assessment studies, evaluation of the quality of ground water is as important as the quantity.

Determination of physico-chemical characteristics of water is essential for assessing the suitability of water for various purposes like drinking, domestic, industrial and irrigation. The ground water quality may also vary with seasonal changes and is primarily governed by the extent and composition of dissolved solids.

Coimbatore city is the one of the major cities in Tamil Nadu and it is well known for industrial activities. The Noyyal river originates from the Vellingiri hills of the Western Ghats in Coimbatore and passes through Coimbatore, Erode and Karur districts of Tamil Nadu and joins to the river Cauvery at Noyyal village of Karur district. The river has a length of 160 km and it has average width of 25m. Noyyal river and its connected tanks are the main sources of ground water which provide water for all the purposes in Coimbatore region. Magudeswaran *et al.* (2005)¹ found that the decrease in various quality characteristics clearly indicates the possibilities of pollution due to industrial

activities such as coffee vegetable oils, leather tanning, textiles and foundries in and around Coimbatore city. The population of Coimbatore has also a strong impact on the Noyyal river with regard to pollution and due to this Noyyal river acts as a carrier for the pollutants. During the non-flow period of the river, water can be stagnated and the pollutants may enter into the ground water. So the ground water quality gets depleted.

Gupta *et al.* (2004)² studied the chemical analysis of ground water quality of Sanganer area, Jaipur to observe the suitability of water for safe drinking and irrigation. Guruprasad (2003)³ carried out a study to find out the suitability of ground water for drinking purposes for which samples were collected along the stretch of Buckingham canal at four villages in Tadepalli Mandal of Guntur district and physio - chemical qualities were tested. Garg *et al.* (2001)⁴ had conducted a study on ground water quality of the Hisar city (Haryana) by the physio-chemical analysis to find out the suitability for drinking purpose.

This study reports the results of physio - chemical analysis of ground water samples, which were collected from either side along the Noyyal river of Coimbatore city during the pre-monsoon season, i.e. March and the post-monsoon season, i.e. September 2005.

Materials and methods

Water samples were collected from either side of the river around 500m distance. Samples were collected from 12 locations during the pre-monsoon, i.e. March and the post-

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monsoon, i.e. September. The sampling locations of the wells are shown in **Fig.1**. The samples were analyzed to determine the concentrations of sodium (Na^+), calcium(Ca^{2+}), total dissolved solids (TDS), alkalinity, sulphate (SO_4^{2-}), chloride(Cl^-), magnesium(Mg^{2+}), total hardness (TH) and electrical conductivity (EC). The tests were carried out as per the standard methods (APHA, 1995)⁵. The results obtained were compared with the IS standards (1983, 1974)^{7,8}.

Results and discussion

The minimum, maximum, mean and standard deviations obtained for the pre-monsoon and post-monsoon periods are reported in **Table 1**.

The pH values found well within the permissible limit. The pH values ranged from 6.98 to 7.74 and 6.65 to 7.23 during the pre-monsoon and post-monsoon seasons respectively. TDS ranged from 220 to 1050 mg/L during the pre-monsoon and from 250 to 1070mg/L during the post-monsoon. In both the seasons, Singanallur (L) showed high TDS values, such as 1030mg/L and 1070mg/L respectively. In all locations, TDS values were well within the maximum limit and hence the water is suitable for both drinking and industrial purposes.

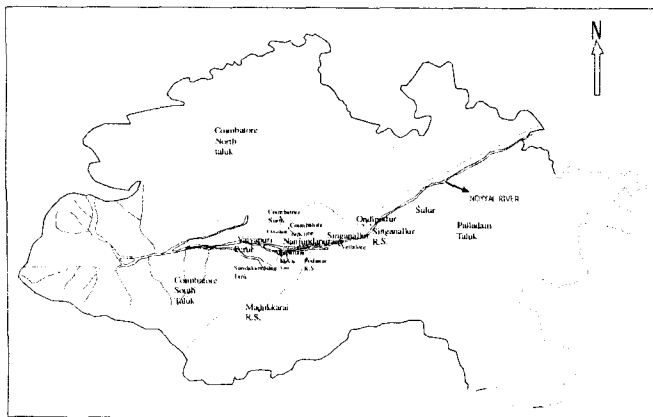


Fig. 1: Sampling locations (wells)

Electrical conductivity values were found very high, ranged between 0.96 to 5.86 m.mhos/cm in the pre-monsoon and from 1.14 to 5.81m.mhos/cm in the post-monsoon. In most of the well locations, EC values exceeded the permissible limits. If the EC values exceed 2.0 m.mhos/cm then the water may not be suitable for irrigation purposes (Kotaiah,1994)⁶. EC values are useful to know about the pollution and to find out the presence of inorganic dissolved solids.

Table 1 : Ground water quality at Coimbatore city

S. No.	Parameters	Pre-monsoon				Post-monsoon				IS 10500 Limits		IS 2296 Limits
		Minimum	Maximum	Mean	SD	Minimum	Maximum	Mean	SD	Desirable	Maximum	Desirable
1	pH	6.98	7.74	7.44	0.21	6.65	7.23	6.98	0.17	6.5 - 8.5	6.5 - 8.5	-
2	TDS (mg/L)	220	1050	635.8	267.4	250	1070	683.3	295.6	500	2000	<1500
3	EC (m.mhos/cm)	0.96	5.68	3.15	1.47	1.14	5.81	3.4	1.6	-	-	<0.25
4	TH (mg/L)	430	1650	954.6	415.6	660	1720	1138.78	379.8	300	600	-
5	Ca^{2+} (mg/L)	90	590	256.7	144.1	195	590	374.2	127.2	75	200	-
6	Mg^{2+} (mg/L)	335	1220	697.9	284.8	370	1385	764.6	298.7	30	100	-
7	Alkalinity (mg/L)	335	805	585.3	131.7	585	1110	845.8	130.4	200	600	-
8	Na^+ (mg/L)	2	9	5.00	2.00	2	11	5.75	3.2	-	-	-
9	SO_4^{2-} (mg/L)	72	372	119.9	78.10	45	220	115.1	45.8	200	400	<1000
10	Cl^- (mg/L)	82	1678	799.2	526.8	154	1574	774.8	486.1	250	1000	<600

Total hardness values ranged from 430 to 1650 mg/L during the pre-monsoon and 660 to 1720mg/L during the post- monsoon. In all wells, the total hardness values exceeded the permissible limit during the post-monsoon and few wells were within the permissible limit during the pre-monsoon period.

The alkalinity varied between 335 and 805mg/L and 585 and 1110mg/L during the pre-monsoon and post- monsoon periods respectively. The alkalinity values were found increasing in the post-monsoon period, compared to the pre-monsoon period, in all wells. This may be due to the movement of pollutants into the ground water storage during rainfall season. Large amount of alkalinity imparts a bitter taste to water. Excess alkalinity in water is harmful for irrigation, which leads to soil damage and reduce crop yields.

The calcium ions ranged between 90 and 590 mg/L during the pre-monsoon season and 195 and 590mg/L during the post-monsoon season. The calcium ion concentration exceeded the limit in most of the places during the post-monsoon and at some wells during the pre-monsoon season. The magnesium ions ranged between 335 and 1220mg/L and 370 and 1385mg/L during the pre-monsoon and post-monsoon seasons respectively. In all the well locations, the values of magnesium exceeded the limit and this indicates the hardness of water.

The chloride concentrations ranged from 82 to 1678 mg/L in the pre-monsoon and 154 to 1574 mg/L during the post-monsoon season. In few wells, the chloride values exceeded the maximum limit during both the pre-monsoon and post-monsoon seasons. If the water with high chloride is used for construction purpose, this may corrode the concrete.

Sulphates were found in the range from 72 to 372 mg/L and from 45 to 220 mg/L during the pre-monsoon and post-monsoon periods respectively. Except one or two places, in all other places the values were found well within the desirable limit. In general, the sulphate values were found to increase in the post-monsoon season compared to the pre-monsoon season. The sulphate content in water is important in determining the suitability of water for public and industrial supplies. Higher concentration of sulphate in water can cause malfunctioning of the alimentary canal and shows cathartic effect on human beings.

The sodium values ranged between 2 and 9 mg/L during the pre-monsoon season and 2 to 11mg/L during the post-monsoon season.

Conclusions

The following conclusions were drawn on the basis of the chemical analysis of ground water along the Noyyal river in Coimbatore city.

- Other than Perur (L) and Perur (R), in the remaining places EC values were greater than 2.0 milli mho/cm. In most of the places, the ground water cannot be used for irrigational purposes due to high EC values
- Except Perur (L), Perur (R) and Podanur (L), in all other locations, the total hardness values were high during the pre-monsoon period, but at these three locations total hardness was high during the post-monsoon season
- TDS and sulphate values were within the maximum permissible limit in both the seasons at all the locations
- The Ca^{2+} and Mg^{2+} ion values were high in most of the places. This indirectly indicates the presence of hardness in water
- In general, the values of all the studied parameters were high and above the standards during the post-monsoon season, compared to the pre-monsoon season in 2005.

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