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GROUND WATER QUALITY OF IDAPADI TALK, SALEM DISTRICT

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Abstract

The water quality of ground water samples from Idapadi Talk, Salem district, Tamil Nadu was analysed for its suitability for irrigation and drinking purposes. The analysis showed a high range of pH (7.96), EC (3464 μmhos/cm), total solids (2425 mg/l), total chloride (632 mg/l). The findings of the study clearly indicated the unsuitability/poor quality of the ground waters of Idapadi Talk for irrigational and domestic purposes.

Key words: Water quality, Irrigation, Drinking purpose.

Introduction

Ground water forms a major source of drinking water for the urban and rural population of India. Besides being the primary source of water supply for domestic use, it is the single most productive source of irrigation. Due to industrial effluents and municipal sewage ground water sources are facing serious problems. Till date, only the waste waters were being stored in the reservoir and the farmers hesitate to use the water for irrigation. Long term storage of waste water in the reservoir certainly poses a serious threat to the groundwater of Tamilnadu. Hence, an attempt was made to analyse the physico-chemical and bacteriological quality of the ground water of the village.

Materials and Methods

Ground water samples were collected from three open wells (depth ranging from 20-30 m) located in the villages. Water samples were collected with optimum care in pre cleaned polythene containers and stored at 4°C. Analytical techniques as described in Standard methods

of APHA (1989) and Trivedy and Goel (1984) were adopted for the physico-chemical and bacteriological characterization such as pH, turbidity, EC, total solids, total hardness, total alkalinity, chloride, nitrate nitrogen, fluoride.

Collection of samples

The water the samples were collected from three different spots like Chittoor, Pulliyampatty and Oruvapatti.

Sample analysis

Physico-chemical parameters of water sample were analysed by following the standard methods given in WHO (1984).

Results and Discussion

Table 1 Analysis for water quality parameters from study area

S.no	Parameters name	Station I (Chitoor)	Station II (Pulliampatti)	Station III (Oruvapati)
1	Turbidity (NTU)	11	18	7
2	Total Dissolved Solids	1705	2425	1585
3	Electrical Conductivity	2436	3464	2264
4	pH	7.88	7.96	7.52
5	Total Alkalinity as (CaCo3 mg/l)	604	680	536
6	Total Hardness as (CaCo3 mg/l)	620	760	588
7	Calcium as Ca mg/l	128	152	120
8	Magnesium as mg/l	96	104	72
9	Sodium as Na mg/l	256	350	220
10	Potassium as K mg/l	38	48	44
11	Iron as Fe mg/l	1.2	1	0
12	Free Ammonia as NH3 mg/l	1.5	1.6	0
13	Nitrate as NO3 mg/l	48	104	32
14	Chloride as Cl mg/l	412	632	396
15	Fluoride as F mg/l	2.8	4.5	3.5
16	Sulphate as SO4 mg/l	120	250	110
17	Phosphate as PO4 mg/l	1.6	1.5	0
18	Tidy's mg/l	4.56	5.88	2.24

The physico-chemical parameters of both the ground waters are shown in the table 1

Physico-chemical parameters

In the study area, the highest turbidity (18NTU) was observed in station II (Pulliampatti). The increasing turbidity may be due to influx of waste water and drainage system into the ground water ecosystem. The highest value of turbidity may be due to the presence of clay and slit which can be removed by coagulation and filtration (Trivedi & Goel 1984).

The high level of pH (7.96) was recorded in Station II. These study areas totally ground water in alkaline level and unfit for drinking purpose because pH level is higher then permeable limit. Though pH has no direct effect on human health, all biochemical reactions are sensitive to variations in pH (Kavitha 2010). The maximum level of Electrical Conductivity (3464) was recorded in Station II, the highest value of conductivity may be due to high concentration of ionic constituents present in water bodies (Abbasi *et al* 1999). The high EC value is harmful for plant growth physically by reducing the intake of water through modifications of osmotic pressure or chemically by metabolic reactions caused by toxic constituents (Rajesh Dhankar *et al* 2008).

Wilcox (1955) had made an attempt to classify the quality of water with respect to irrigational purpose by bringing into considerations the electrical conductivity as a vital parameter. It is as follows: Excellent (250 μmhos/cm), Good (250-750 μmhos/cm), permissible (750-2000 μmhos/ cm), Doubtful (2000-3000 μmhos/cm), Desirable (3000 μmhos/cm). The high range of EC observed in the present study clearly indicated the unsuitability / poor quality of ground waters of station II.

The total dissolved solids of the ground waters showed as maximum in 2425 mg/l in station II. The maximum value is compared to that permiable limit (500mg/l). This may be due to the percolation of salts from the industrial effluent. Water with high solid residues is normally less palatable and may induce an unfavorable physiological reaction in the transient consumer (Park & Park 1980). The maximum content of total dissolved solid might be due to high nutrients and dense growth of plankton, while maximum content of total solids could be due to low nutrient and less plankton growth (Trivedy 1993).

In ground water, hardness is mainly due to carbonates and sulphates of calcium and magnesium. Hardness may also be caused by ferrous and manganese. The acceptable limit of total hardness is 300 mg/l, but in the present study, a very high level of hardness (760 mg/l) was observed in station II. The alkalinity of water is mainly due to carbonates and bicarbonates. The hardness of water reflects the higher concentration of many cations. A positive correlation was observed between total hardness and alkalinity and other anions.

The lowest total alkalinity value (536 mg/l) was recorded in station III and highest was recorded (680) in station II. Total alkalinity of the collected water sample was well above the acceptable range of 600 mg/l. The total alkalinity may be due to the presence of more quantity of carbonate and bi-carbonates ions. The highest concentration of chloride (632 mg/l) was noticed in station II. The high content of chloride is due to the percolation of effluent and sewage into the ground water. Chlorides impart a salty taste to water and people who are not accustomed to high chlorides in water are subjected to laxative effect (Rao & Rao 1991).

The calcium content of the ground water ranged from a minimum of 120 mg/l-152mg/l. The high amount of calcium found in station II ground water. The chloride concentration is not only an index of eutrophication, but also of pollution casused by cattle, sewage and other wastes (Mishra & Yadav, 1978). Dharkar (1979) reported that potable water has chloride content between 108 and 138 ppm which indicates medium pollution and its content between 60 and 200ppm indicates heavy pollution. Observations in the current investigation revealed that the chloride amount in station II of the ground water suggesting to be heavily polluted.

Then highest content of magnesium (104 mg/l) was recorded at station II. While the lowest amount was noticed station III. According to Asthana and Meera Asthana (2005) combustion of fossil fuels is the main source of manganese, in the environment while industrial process using manganese, fertilizers and the use of this metal as also contribute some manganese, to the environment. Phosphate is a vital nutrient and a limiting factor for the growth of phytoplankton which was varied from absence in station III and maximum 1.60mg/l at station I ground water. The sulphate in the ground waters ranged from 110 to 250 mg/l. The peak value was occurred in station II, while was lower in station III. Adridge (1997) reported that the concentration of sulphate is an index of eutrophication and

it plays a dynamic role in many of the ground water ecosystem and is subjected to transformation by microorganism. The concentration of sodium was reported to be 220 to 350 mg/l.

The nitrate content of the sample was 104 mg/l which was higher than permissible limit. When present in high concentrations, nitrate enters the human body through the use of ground water for drinking and cause a number of health disorders. Fluoride content of the water sample was minimum (2.8 mg/l) and maximum (4.5 mg/l). In ground waters, natural concentration of fluoride depends on geological, chemical and physical character of acqufier, porosity and acidity of soil and rocks, temperature, the action of other chemicals and depth of wells. Fluoride in minute quantity is essential for normal mineralization of bones and formation of dental enamel. However, its excessive intake may result in fluorosis (Kavitha 2010).

Conclusion

It is concluded that physic-chemical parameters observed in the study area revealed that all area ground waters are unfit for drinking and irrigation purpose. The various physico-chemical parameters such as PH, turbidity, TDS, EC, Ca, Mg, Na, K, Fe , Mn, NO3, CI, F, SO4, PO4 were estimated by following the standard methods given in WHO (1984) . Physico-chemical analysis indicated that some of the parameters like turbidity, EC, PH, TDS, lron, Total Hardness as CaCO3showed more values then the permissible limit give by the WHO (1997).

Thus the present study clearly indicates that most of the parameters of the ground water samples of station II such as EC, solid, alkalinity, Chloride exceeded the maximum permissible limit rendering the water unfit for drinking and irrigational purposes. Therefore, proper remedial measures are to be taken immediately through stringent polices; otherwise the whole system of this area may get crippled in the near future.

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