



Research Article

## WATER QUALITY ANALYSIS IN DIFFERENT LOCATIONS OF SATTUR TOWN, VIRUTHUNAGAR DISTRICT, TAMIL NADU, INDIA

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### ABSTRACT

Water quality analysis in different locations of Sattur Town, Viruthunagar District, Tamil Nadu, India was carried out. Physico-chemical parameters of the water samples such as appearance (clear), colour (colourless), Odour (agreeable), Turbidity (1 to 2NTU), TDS (1337 to 11830 mg/l), EC (1910 to 16900  $\mu$ mhos/cm), pH (7.4 to 8.1), Total Alkalinity (280 to 880 mg/l), Calcium (64 to 490 mg/l), Magnesium (38 to 300mg/l), Nitrate (3 to 40 mg/l), Chloride (400 to 5100 mg/l), Fluoride (0.4 to 1.0 mg/l), Sulphate (17 to 85 mg/l), Dissolved O<sub>2</sub> (9.54 TO 15.47 mg/l), Dissolved CO<sub>2</sub>(1.68 to 3.78 ppm), Salinity (0.73 to 1.93 ppt) were observed in present investigation. Contamination of water resources occurs due to poor water, sanitation, animal manure, improper disposal of solid waste and domestic sewage. All the results are agreeable with that of earlier findings.

**Keywords:** Water quality, Physico-Chemical, Dissolved O<sub>2</sub>, Dissolved CO<sub>2</sub>.

### INTRODUCTION

Water is essential for the survival of any forms of life. Water accounts for about 70% of the weight of a human body. About 80% of the earth's surface is covered by water (Khadsan & Kadu, 1970). Ground water constitutes 85% of the source of drinking water in India (Pahuja *et al.*, 2010; Wyrwoll, 2012). Ground water is considered much cleaner than surface water. Contamination of water resources is occurs due to poor water resources, sanitation, animal manure, improper disposal of solid waste and domestic sewage (Grabow, 1996; Medema *et al.*, 2003). In many areas groundwater is polluted by human activities. If groundwater becomes polluted, it will no longer be safe to drink. The physical-chemical characteristic of water determines its usefulness for municipal, commercial, industrial, agricultural and domestic purpose. Hence the present study was designed to analyze the physico-chemical parameters of the water samples collected in the bore wells from the selected places in and around the Sattur town, Viruthunagar district, Tamil Nadu, India.

### MATERIALS AND METHODS

The sampling places are referred as stations (I – X). The stations are represented as Peria kollapatti (I), Thendral nagar (II), Perumal kovil theru (III), Padanthal (IV), Amir palayam (V), Anna nagar (VI), Thenvadal puthu theru (VII), Sadayampatty (VIII), Pudu palayam (IX), Murugan kovil theru (X). Water samples were collected from various bore well located in and around sattur town, Viruthunagar district. The samples were collected in 1000 ml plastic bottles with necessary precaution. They were then carefully sealed, labeled and taken for analysis physico-chemical parameters. The physical factors such as, appearance, colour, odour, Turbidity, TDS, and EC and the chemical factors such as pH, Total alkalinity, Calcium, Magnesium, Nitrate, Chloride, Fluoride, Sulphate, Dissolved carbon-di-Oxide, Dissolved oxygen and Salinity were analyzed.

### RESULTS AND DISCUSSION

In this study physical factors such as appearance (clear), colour (colourless) and odour (agreeable) were observed in the entire water sample from ten different locations.

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Suspension of particles in water interfering with passage of light is called turbidity. Turbidity value ranges from 1 NTU to 2 NTU. The high value was recorded during VI and low value was recorded during I to V and VII to X. The TDS in the sample is in between 1337 to 11830 mg/L. High TDS in ground water may be due to ground water pollution when waste waters from both residential and dyeing units are discharged into pits, ponds and lagoons enabling the waste migrate down to the water. The EC ranges from 1910  $\mu$ mhos/cm to 16900 $\mu$ mhos/cm. The high value of conductivity was recorded as VI where as low value was recorded X. EC in the water is due to salt present in water and current produced by them. Conductivity of water depends upon the concentration of ions and its nutrient status and variation in dissolved solid content. The water during summer decreases as a result of death and decay of plants and animals.

The pH of the groundwater samples are neutral or close to it as they all range from 7.4 to 8.1 which are within

the permissible limits 6.5- 8.5 given by Indian Standards, also complies with standard of 7-8 given by WHO(Organization, 1996). In this study the permissible range of pH (7.4 to 8.1) were recorded in all the locations. Alkalinity in the bore wells water is caused by bicarbonate and carbonates in all the samples. The total alkalinity content in the sample is in between 280 to 880 mg/l. Calcium may dissolve readily from carbonate rocks and lime stones or be leached from soils. But calcium is an essential nutritional element for human being and aids in the maintaining the structure of plant cells. In this investigation, the estimated calcium values are recorded between 64 and 490 mg/l. For most of the groundwater samples, the calcium values are found within the maximum permissible limit (200 mg/l). The calcium value is slightly higher than permissible limit at location IV, V & VI; this may be due to the cationic ion exchanges with sodium.

**Table 1.** Physical parameters of drinking water samples from different localities of Sattur town, Viruthunagar district, Tamil Nadu, India.

Physical Parameters	Selected sites									
	I	II	III	IV	V	VI	VII	VIII	IX	X
Appearance	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Colour	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless
Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
Turbidity	1	1	1	1	1	2	1	1	1	1
TDS(mg/l)	4830	3374	2884	6440	5614	11830	4410	2282	4410	1337
EC( $\mu$ mhos/cm)	6900	4820	4120	9200	8020	16900	6300	3260	6300	1910

In this study the permissible range of magnesium (38 to 300 mg/l) was recorded in all the locations. Magnesium acts as co factor for various enzymatic transformations within the cell especially in the trans-phosphorylation in algal, fungal and bacterial cell (WHO, 1996). Magnesium is one of the main constituent in natural water and it's an important contributor for hardness of water. The nitrate values ranged between (3 and 40 mg/l) not exceeded the desirable and permissible limit (45mg/l) of WHO. Nitrate in natural waters can be traced to percolating nitrate from sources such as decaying plant and animal materials, agricultural fertilizers, domestic sewage. A nitrate content of more than 100mg/l impact bitter taste to water and may cause physiological problem. Drinking water contains more than 50mg/l nitrate can cause methamoglobinemia in infants. Nitrate causes the overgrowth of algae, other organism and fouls the water system. Epidemiological studies have predicted association between exposures to nitrate and gastric cancer because of the reaction of nitrate with amine in diet forming Carcinogenic nitrosomoamines.

Chloride present in ground water samples is at the range of 400 to 5100 mg/l, which not exceeded the locations the permissible limit of 250 mg/l as per Indian standards as well as WHO standards and this obviously affects the taste of the water. Another research carried out in Surat City shows the chloride content in the groundwater

of Surat city is in the range of 432-2360, 418-2440 and 71-2344 mg/l for the year 2007, 2008 and 2009 respectively (Yadav, 2011). This may be due to saline water intrusion. Chlorine enters the body through food and water. It does not remain in the body, due to its reactivity. Chloride present in natural waters is due to the dissolution of salt deposits, salting of roads, and effluents from chemical industries. Chloride is the most abundant anion in the human body. No evidence has been found suggesting that ingestion of chloride is harmful to humans. Chloride is a widely distributed element in all types of rocks in one or the other form. Its affinity towards sodium is high. Therefore, its concentration is high in ground waters, where the temperature is high and rainfall is less. Soil porosity and permeability also play a key role in building up the chlorides concentration.

Fluoride present in drinking water is significant from physiological point of view, in human beings and other mammals it causes fluorosis. Especially dental fluorosis is causing serious threat in many parts of India. Many workers have reported that if fluoride concentration in drinking water exceeds 1.5mgL-1, it causes teeth mottling and still higher concentration may lead to skeletal fluorosis. During present investigation, fluoride in water sample was found to vary from 0.4 mgL-1 to 1.2 mgL-1.

**Table 2.** Chemical parameters of drinking water samples from different localities of Sattur town, Viruthunagar district, Tamil Nadu, India.

Chemical Parameters	Selected sites									
	I	II	III	IV	V	VI	VII	VIII	IX	X
pH	7.4	8.3	7.9	8.0	7.5	7.6	8.1	7.8	8.0	8.1
Total Alkalinity(mg/l)	880	552	536	528	592	500	760	380	600	280
Calcium (mg/l)	144	160	160	245	240	490	96	100	144	64
Magnesium (mg/l)	86	120	118	115	125	300	70	82	86	38
Nitrate (mg/l)	10	9	8	13	10	40	6	6	10	3
Chloride(mg/l)	1750	1315	975	2575	2600	5100	1800	835	1750	400
Fluoride(mg/l)	0.8	0.8	0.8	1.0	1.0	1.2	0.6	0.6	0.8	0.4
Sulphate(mg/l)	85	75	26	80	23	65	71	52	85	17
Dissolved O <sub>2</sub> (mg/l))	15.47	12.91	10.67	11.79	13.47	10.16	11.23	11.79	9.54	10.56
Dissolved CO <sub>2</sub> (ppm)	3.56	3.14	3.78	2.58	2.14	1.93	1.68	2.41	2.19	1.75
Salinity (ppt)	1.81	1.93	1.78	1.41	1.14	1.53	1.38	1.20	1.11	0.73

Sulphate concentration in collected groundwater samples ranged from 17-85 mg/l as in the permissible limit of 200 mg/l as per Indian standards and 250 mg/l as per WHO Standards. Maximum concentration is found in ground water sample collected from the locations I and IX which is 85 mg/l. Dissolved O<sub>2</sub> is an important parameter in water quality assessment and reflects the physical and biological processes prevailing in the water. The DO<sub>2</sub> values indicate the degree of pollution in water bodies. The DO<sub>2</sub> values in the groundwater range from 9.54 to 15.47 mg/L. The minimum value was observed in sample IX and the maximum value in the location I. The standard value of dissolved oxygen in groundwater is 5 mg/L, 89% of the samples are below the required limit of WHO. It may be due to certain inorganic oxidizable substances, biological decomposition of organic matter, rise in temperature and oxygen demanding wastes etc. The Dissolved CO<sub>2</sub> values in the groundwater range from 1.68 to 3.78 ppm. The minimum value was observed in samples all the locations except these samples VII and the maximum value was observed in the sample III. Carbon dioxide is present in water in the form of a dissolved gas. Surface waters normally contain less than 10 ppm free carbon dioxide, while some ground waters may easily exceed that concentration.

## CONCLUSION

Salinity is the saltiness or dissolved salt content of a body of water. The salinity values in the groundwater range from 0.73 to 1.93 ppt. The minimum value was observed in sample X and the maximum in the samples II. The results pertaining to water quality from different locations of around Sattur town, Viruthunagar district, Tamil Nadu revealed that all the tested physico-chemical parameters such as appearance, colour, odour, Turbidity, TDS, EC, total dissolved salts, pH, Total alkalinity, Total Hardness, calcium, magnesium, Nitrate, chloride, Fluoride, sulphate, dissolved oxygen, dissolved carbon-di-oxide and salinity are at the prescribed standards of WHO and EPA. However, careful attention towards contamination of water sources is recommended so that future risk in terms of

environmental pollution and human health concerns could be minimized or controlled. Similar studies are also recommended in all human settlements (villages and towns) so that reliable data could be available for health care departments, planners, community welfare organizations and researchers.

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