

PHYSICO-CHEMICAL CHARACTERISTICS OF THE WATER OF SELECTED THEERTHAMS OF RAMANATHASWAMY TEMPLE IN RAMESWARAM, TAMIL NADU

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Abstract: Rameswaram is one of the important pilgrim and tourist places in India. Ramanathaswamy temple is located in Rameswaram island. This temple attracts lakhs and lakhs of devotees and tourists including foreigners every year. The devotees and tourists come to this temple, take bath on the holy water of different theerthams. The physico chemical characters of many theerthams of the temple were analyzed. The physical parameters such as, pH, Temperature and electrical conductivity values of all the selected theerthams were recorded within the permissible limit. Dissolved oxygen of the selected theertham water have less than desirable level. Among the 10 theerthams, Agni theertham showed very low level of dissolved oxygen. Free carbon dioxide is absent in Nala and Agni theerthams. High values of carbondioxide present in Savithri, Gayathri and Saraswathi theerthams. Chloride and salinity values are high in all the selected theerthams except Sethumadhava theertham. Bicarbonate alkalinity is found to be high in Savithri, Gayathri and Saraswathi theerthams. Carbonate alkalinity is absent in all theerthams except Nala and Agni theertham. The total hardness of all theerthams is high, exceeds the permissible limit of WHO. Calcium hardness is found to be high in Sanku and Nala theerthams.

Keywords: Theerthams, Physio-chemical parameters, carbondioxide, Carbonate alkalinity.

INTRODUCTION

Water is essential to plants, animals and man, without water life on earth would not exist, hence it has been referred to as a universal solvent [1]. Ground water is becoming an important source of water supply in many regions of the country since there has been a tremendous increase in the demand for freshwater due to over increasing growth in population. The rapid growth of urban areas has adversely affected the ground water quality due to over exploitation of resources and improper waste disposal practices [2]. Ground water is becoming an important source of water supply in many regions of the country since there has been a tremendous increase in the demand for freshwater due to over increasing growth

in population. The rapid growth of urban areas has adversely affected the ground water quality due to over exploitation of resources and improper waste disposal practices. Hence there is always a need for and concern over the protection and management of ground water quality [3]. The main objective of the present study is to evaluate the quality of the all theerthams, are used by lakh and lakhs of people. During festivals large crowds from all walks of life and from all over the globe gather. In this area, people taking bath in the highly contaminated Agni theertham and also other theerthams is a common practice of the devotees. The peoples also drink the water of all theerthams, have the faith that the theerthams will cure the diseases. Some of the Yatras may be diseased due to physico-chemical and biological characteristics of the pilgrim waters. Since little information was available on water quality of theerthams of Ramanathaswamy temple at Rameswaram. Therefore an attempt has been made to study some important Physico-Chemical parameters, such as, pH, Temperature, Conductivity, Dissolved Oxygen, Free carbondioxide, Chloride, Salinity, Alkalinity– Bicarbonate and Carbonate, Hardness –Total and Calcium hardness.

MATERIALS AND METHODS

Study Area

Rameswaram is located at the south eastern end of the Indian Peninsula at Latitude $9^{\circ} 13' 9'' 20'$ and Longitude $79^{\circ} 05' 79'' 15'$ in Ramanathapuram District (Fig. a). There a major Lord Siva Temple called Ramanathaswamy Temple. This is one of the major Lord Siva Temples in India. This temple is in the center of town, right next to the sea. The Agni theertham is located about 200m from the temple, is a sacred bathing place. There are 22 theerthams (tanks) present inside the temple in which pilgrims traditionally bathe in before seeing the deities [3] (Fig. b).

METHODS

The water samples were collected from 10 theerthams, such as, Mahalakshmi theertham, Savithri theertham, Gayathri theertham, Saraswathi theertham, Sanku theertham, Sakkara theertham, Sethu Madhava theertham, Nala theertham, Neela theertham and Agni theertham in January 2007 for physico-chemical studies. Water samples were collected in 1 litre pre-cleaned and sterilized bottles with necessary precautions. Temperature was measured by thermometer on the spot. For measurement of other physico-chemical parameters, samples were brought to the laboratory. The pH was measured using pH meter. Dissolved oxygen was determined by Winkler's method. Chloride and salinity was estimated by Harvey's titration method. Free carbondioxide, alkalinity and hardness were analysed as per standard procedure [4].

RESULT AND DISCUSSION

The physico-chemical parameters of the selected 10 theerthams in Ramanathaswamy temple at Rameswaram have been presented in Table 1. In the present study, water temperature varied from 27° C to 30° C. The maximum temperature (30° C) is recorded in Agni theertham only (Table 1). The pH of the selected theerthams did not show wider variations. The WHO acceptable limit for pH is 6.5 – 8.5. In the present study, the pH was slightly alkaline 7.1 to 7.8. The maximum pH value was recorded in Sethumadhava theertham and Nala theertham. Similar results have been reported in the ground waters of Tarikere Taluk [5]. Dissolved oxygen is an important water quality parameter in assessing water pollution. In the present study, dissolved oxygen of the selected theertham water ranged from 0.6 mg/L to 1.8 mg/L (Table 1). The dissolved oxygen of all the selected theerthams were less than 4 mg/L which may be due to seepage or leaching from adjacent soil and domestic and other wastes. Similar results of dissolved oxygen values were reported in the ground water of Nagerkoil Town [6].

Table 1: Physico Chemical Parameters of the selected theerthams of Ramanathaswamy Temple at Rameswaram

Physico-Chemical Parameters	Maha lakshmi	Savithri	Gayathri	Saras wathi	Sanku	Sakkara	Sethu madhava	Nala	Neela	Agni
Temperature °C	28	28	28	28	29	27	28	27	27	30

pH	7.5	7.4	7.3	7.1	7.2	7.4	7.8	7.8	7.7	7.4
Dissolved Oxygen (mg/L)	1.8	2	1	1.4	2.2	1.4	1.8	1.2	1	0.6
Free Carbondioxide (mg/L)	16	40	36	40	20	10	14	-	6	-
Chloride (mg/L)	709	1064	1843	2127	992	1134	213	1064	638	11344
Salinity (mg/L)	128	192	332	383	2	204	384	192	2	20476
Bicarbonate alkalinity (ppm)	240	0	7	9	300	8	140	0	160	138
Carbonate alkalinity (ppm)	-	500	520	540	-	220	-	145	160	24
Total hardness (ppm)	988	-	-	-	-	-	-	21	-	-
Calcium hardness (ppm)	120	868	826	660	690	640	560	876	602	650
		112	160	140	268	168	100	220	106	200

Carbondioxide is essential for photosynthesis and its concentration affects the aquatic fauna and its productivity [7]. In the present study, carbondioxide ranged from 6 mg/L to 40 mg/L. Carbondioxide was absent in Nala and Agni theerthams (Table 1). Similar result was reported in Baigul and Nanaksagar reservoirs during the period of investigation [8]. The chloride content in the selected theerm was varied from 213 mg/L to 11344 mg/L (Table 1 & Fig. c). All the selected theerthams have shown high chloride concentration higher than the WHO permissible limit (250 mg/L) except Sethumadhava theertham. This increase may be due to sea water intrusion in the

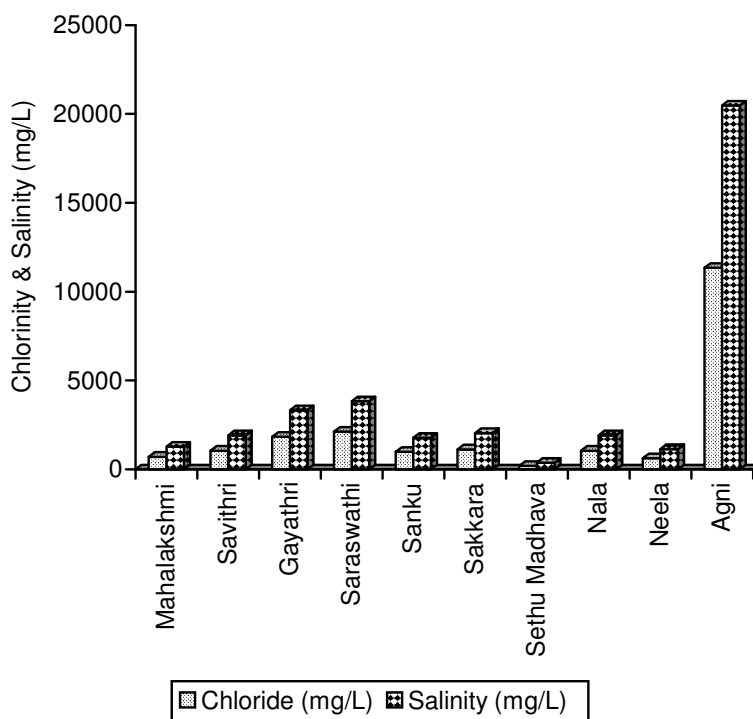


Fig. C. Showing the Chloride (mg/L) and Salinity (mg/L) of the selected theerthams of Ramanatha Swamy Temple at Rameswaram

well and evapotranspiration of water body. High values of chloride in a freshwater lake may be due to input of organic matter [9]. In the present study, the salinity ranged from 384 mg/L to 20476 mg/L (Table 1 & Fig. c). The maximum salinity and chloride level occur in Agni theertham reflects the seepage of sewage water. Bicarbonate values ranged from 138 ppm to 540 ppm (Table 1). Bicarbonate alkalinity value was exceed the permissible limit in Savithri, Gayathri and Saraswathi theerthams. Hence high bicarbonate content of this area due to dissolution of soil carbondioxide. Bicarbonate content of the ground water sample varies from 55 to 542 mg/L in Chengalpet region [10]. Carbonate alkalinity was present in Nala and Agni theerthams where the values were 21 ppm and 24 ppm respectively. Carbonate alkalinity was absent in all other theerthams (Table 1). Similar results of carbonate alkalinity were reported in Palar river water [11]. Excessive alkalinity may cause eye irritation in humans and chlorosis in plants [12]. The total hardness of all the theerthams ranged from 560 ppm to 988 ppm (Table 1). The data indicates that none of the theerthams falls within the WHO permissible limits (500 ppm) for total hardness. Ground water quality in some villages of Jind City of Haryana showed the total hardness ranged from 340 to 3936 ppm [13].

Calcium hardness value varied from 100 ppm to 268 ppm (Table 1). All the theerthams are well in the WHO permissible limit (75–200 mg/L) except Sanku and Nala theerthams, where it is 268 ppm and 220 ppm respectively. High calcium content in the water is the indication of pollution. The present values are very high when compared that of Rajasthan ground water [14].

CONCLUSION

During religious practices, festivals and rituals, considerable quantity of flowers, leaves, food remnants and other organics are dumped into Agni theertham. The decomposition of these organic materials changed the physicochemical characteristics of Agni theerthams. These water which percolate into the other theerthams which alter the physicochemical parameter. Therefore the physicochemical parameters of holy water are above the permissible limit. Yatras taking bath in the highly contaminated Agni theertham and also other theerthams is a common practice. The peoples also drink the water of all theerthams have the faith that the theerthams will cure the diseases, physico-chemical parameters of theerthams are above the permissible limit which may cause disease or disorder to the Yatras.

The study concludes that the holy water of Ramanatha Swamy Temple get contamination by human activities. It needs special attention to prevent the contamination of holy water of all theerthams.

References

- [1] Ravikumar, M., S. Manjappa, B.R. Kiran, E.T., Puttaiah, Patel, A.N. 2006, Physico-chemical characterization of Neelgunda Tank Near Harapanahalli, Davanagere, *Ind. J. Env. Prot.*, 26(2): 125–128.
- [2] Jain, C.K., Bhatia, K.K.S., Kumar C.P., Purandara, B.K. 2003, Ground water Quality in Malaprabha Sub-basin, Karnataka, *Ind. J. Env. Prot.*, 23(3): 321–329.
- [3] John Howley, Jada Bharata Dasa, 1996, Holy Places and Temples of India, Spiritual Guides, Practical Travel, New Delhi.
- [4] APHA, 1975, Standard methods for the examination of water and waste water, APHA Inc., New York: 1193.
- [5] Harish Babu, K., Puttaiah, E.T., Vijayakumar, T., Shashi Shekar, T.R., 2004, Evaluation of Ground water Quality in Tarikere Taluk, *Ind. J. Env. Prot.*, 24(9): 684–688.

- [6] Shanmugha Prasad, C.K., Umayoru Bhagan, V. 2004, Physico-chemical characteristics of underground water in Nagercoil Town (South), *Ind. J. Env. Prot.*, 24(1): 53–56.
- [7] Kataria, H.C., Iqbal, S.A., Shandilya, A.K., 1996. Limno-chemical studies of Tawa Reservoir, *Ind. J. Env. Prot.*, 16(11): 841–846.
- [8] Mustafa, S., Ahmad, Z., 1985. Environmental factors and Planktonic Communities of Baigal and Nanaksagar reservoirs, Nainital, *J. Bombay Nat. Hist. Soc.*, 82(1): 13 – 23.
- [9] Ara, S., Khan M.A., Zarger, M.Y. 2003. *Ind. J. Env. Ecoplan.*, 7(1): 47–50.
- [10] Elango, L., Sureshkumar, S., Rajmohan, N. 2003, Hydrochemical studies of ground water in Chengalpet Region, *Ind. J. Env. Prot.*, 23(6): 624–632.
- [11] Ramamurthy, N., Subashini J., Raju, S.2005, Physico-Chemical properties of Palar River in Tamilnadu, *Ind. J. Env. Prot.*, 25(10): 925–928.
- [12] Sharma, B.K., Haur, K. 1994, Water Pollution, Goel Publishing House, Krishna Prakasam media (P) Ltd., Meerut.
- [13] Garg, V.K., Chaudhary, A., Deepshikha, K., Dahiya, S. 1999. An Appraisal of Groundwater Quality in some villages of District Jind, *Ind. J. Env. Prot.*, 19(4): 267–272.
- [14] Olaniya, M.S., Sharma, H.C., Saxena, K.L. 1979. Turbidity and bacterial removal from tank water during natural filtration, The Symposium on Environmental Biology, Muzaffarnagar, *Proceedings*, 419–428.