Correlation among certain physical, chemical and nutrient parameters observed in three temple ponds at Thirupparankundram near Madurai, Tamilnadu. India.

D. Manoharan[1*] and L. Isaiarasu[2]

[1]*TVS Lakshmi School, Madurai, India.*

[2] *Department of Zoology, ANJA College, Sivakasi, India.*

*Corresponding author email: bellimano1@gmail.com

Abstract

Correlation analysis among the physical, chemical and nutrient parameters of three freshwater temple ponds at Thirupparankundram, near Madurai was worked out for the observation made on the monthly changes in 15 surface water parameters for a period of three years from September 2009 to August 2012. Varied correlation was noticed among the various physical, chemical and nutrient parameters. This relationship among the physical, chemical and nutrient parameters was found to be influenced by the seasonal changes and altitudinal variations.

Keywords: Correlation analysis, Temple ponds, Thirupparankundram.

Introduction

Water supports life on earth and is the substance around which the entire fabric of life is woven. Ponds, as source of water are of fundamental importance to man. Ponds may have been either natural water sources exploited by man at different times to meet different needs or may have been created for a multitude of different purposes (Rajagopal *et al.,* 2010). Freshwaters of the world are collectively experiencing markedly accelerating rates of qualitative and quantitative degradation (Carpenter *et al.,* 2011). The specific objective of the study is to observe the changes in certain physical, chemical and nutrient parameters in the surface waters of three ponds that are

located at different altitudes but at the same geographical location (Manoharan *et al.,* 2014) and identify the relationship in their occurrence.

Study Area

Thirupparankundram, is a town located about six kilometers south-east of Madurai, a historical city in the southern part of India. It is a historical holy place known for the famous temple of Lord Subramanya situated at the base of the hillock and has a heavy inflow of pilgrims regularly for worship from all over the state and tourists from other states of India and abroad. There are three ponds associated with this temple, one on the top of the hillock namely Kasi theertham, the second one within the temple, Lakshmi theertham and the third one outside the temple, Saravana poigai. Geographically, these ponds are associated with a hillock located at 9°54'N; 78°7'E from the base at 131MSL measuring a total height of 1056 feet. All these three ponds receive rain water which drains out from hillock and this is the only source of water in these ponds. The ponds are used for various human activities such as, bathing, washing and some recreation. Interestingly, these three ponds which are at the same geographical location and fed by rain water during the monsoon showers differ in their size, altitude and human impact. This provides a unique opportunity to study the physico-chemical and nutrient parameters in the surface water of the three ponds and identifying relationship among them through correlation analysis.

Materials and Methods

Sampling of water was done for every month consecutively for a period of three years from September 2009 to August 2012 and analyzed on the days of sampling. Samples were collected between 6 am and 8 am on all days with the view of ensuring uniformity. The water samples were transported to the laboratory and analyzed for various physical, chemical and nutrient parameters following standard methods (Adoni *et al*., 1985). The month wise analysis of the rainfall data for this region enabled the recognition of three distinct seasons as Monsoon (September-December), Post-monsoon (January-April) and Pre-monsoon (May-August) for the convenient interpretation of the observations in the present study.

Result and Discussion

Correlation co-efficient is an index of association between continuous variables and is said to form a measure of covariance between two series. This may have values ranging from +1 to –1.

Correlation coefficient equal to +1 corresponds to a rectilinear relationship (of the form Y= a + bx) in which the two variables are positively related. Correlation co-efficient equal to – 1 corresponds to a rectilinear relationship (of the form Y = a – bx) in which the two variables are negatively related. Values near 0 may arise when there is no relationship and when there is a curvilinear relationship (Kothari, 2004).

Tidame and Shinde (2012) reported that statistical analysis through Pearson's correlation co-efficient of various physical, chemical and nutrient parameters and zooplankton groups to show that they are related with each other. In the present study, the simple correlation co-efficient between physical, chemical parameters of pond water and abundance of zooplankton in Kasi theertham, Lakshmi theertham and Saravana poigai were analyzed. The values of the simple correlation co-efficient worked out between the physical, chemical and nutrient parameters observed in the temple ponds during the period of this study are given in Tables 1 to 9. During the period from September 2009 to August 2010, the Simple correlation among the different physical, chemical and nutrient parameters in Kasi theertham showed 66 positive correlations and 38 negative correlations. In this, maximum positive correlation (0.82) was noticed between total hardness and water temperature, while the minimum correlation (-0.86) was noticed between total filterable residue and air temperature and also between total filterable residue and total nitrate content (Table 1).

In Lakshmi theertham, there were 71 positive correlations and 33 negative correlations. In this, maximum correlation (0.68) was noticed between dissolved oxygen and air temperature and sulphate and calcium, while the minimum correlation (-0.88) was noticed between magnesium and calcium (Table 4). In Saravana poigai, there were 63 positive correlations and 41 negative correlations. In this, maximum correlation (0.88) was noticed between nitrate and sulphate, while the minimum correlation (-0.93) was noticed between dissolved oxygen and free carbon di-oxide (Table 7). During the period from September 2010 to August 2011, the simple correlation among the different physical, chemical and nutrient parameters in Kasi theertham showed 65 positive correlations and 39 negative correlations. In this, maximum correlation (0.81) was noticed between magnesium and calcium and nitrate and phosphate, while the minimum correlation (-0.61) was noticed between phosphate and pH (Table 2). In Lakshmi theertham, there were 63 positive correlations and 41 negative correlations. In this, maximum correlation (0.74) was

noticed between nitrate and phosphate, while the minimum correlation (-0.93) was noticed between free carbon dioxide and alkalinity (Table 5).

In Saravana poigai, there were 62 positive correlations and 42 negative correlations. In this, maximum positive correlation (0.76) was noticed between nitrate and air temperature, while the minimum correlation (-0.78) was noticed between magnesium and dissolved oxygen (Table 8). During the period from September 2011 to August 2012, the simple correlation among the different physical, chemical and nutrient parameters in Kasi theertham, showed 53 positive correlations and 51 negative correlations. In this, maximum correlation (0.79) was noticed between nitrate and air temperature, while the minimum correlation (-0.81) was noticed between nitrate and total filterable residue (Table 3). In Lakshmi theertham, there were 80 positive correlations and 24 negative correlations. In this, maximum correlation (0.78) was noticed between dissolved oxygen and free carbon di-oxide, while the minimum correlation (-0.56) was noticed between total filterable residue and pH (Table 6).

In Saravana poigai, there were 65 positive correlations and 39 negative correlations. In this, maximum correlation (0.86) was noticed between magnesium and salinity and calcium and total hardness, while the minimum correlation (-0.75) was noticed between phosphate and total filterable residue (Table 9). Sharma *et al.* (2008) had reported the chloride to show positive correlation with dissolved oxygen; alkalinity show positive correlation with chlorides, nitrates and phosphates; hardness to show positive correlation with nitrates and phosphates. On the contrary, in yet another observation nitrate had showed negative correlation with chloride, TDS, and dissolved oxygen; phosphate showed negative correlation with chlorides, alkalinity and dissolved oxygen in Jaisamand Lake, Udaipur (Sharma and Sarang, 2004). In the present study, similar observations have been made in Kasi theertham during September 2011 to August 2012 wherein, chloride showed positive correlation with dissolved oxygen. Similarly, phosphate showed negative correlation with dissolved oxygen in Saravana poigai during September 2011 to August 2012. According to Welch (1952) in most of the tropical freshwater bodies, pH is always correlated with photosynthetic activity and phytoplanktonic biomass. Bahura (1998) found positive correlation between pH and carbonate alkalinity. Similar observation was noticed in Kasi theertham during September 2010 to August 2011. Prakash (1982) found inverse relation between dissolved oxygen and carbon dioxide. Similar observation of negative correlation was

noticed between dissolved oxygen and free CO_2 in Saravana poigai during the study period. In Alisagar dam, Nizamabad, pH showed positive correlation with chloride, phosphate, carbon dioxide and dissolved oxygen and negative correlation with magnesium and carbonate alkalinity (Tamlurkar and Ambore, 2006).

Similarly in Saravana poigai pH showed positive correlation with dissolved oxygen during September 2010 to August 2011 and negatively correlated with alkalinity during September 2009 to August 2010. In Lakshmi theertham, the pH negatively correlated (-0.47) with magnesium during September 2009 to August 2010. Trivedy *et al.* (2009) observed a significant positive correlation between total alkalinity and total hardness (r=0.821); calcium (r=0.821) and magnesium (r=0.851). Similar results have been obtained in the present study between alkalinity and total hardness in Lakshmi theertham and Saravana poigai; between alkalinity and magnesium in (r=0.40); (r=0.49) and (r=0.60) Kasi theertham and in Lakshmi theertham (r=0.51). Makode and Charjan (2010) observed that significant positive correlation with carbon di-oxide, while inverse correlation-ship associated with dissolved oxygen. During rainy season, the water influx in to the Chikhaldara Lake on its way comes in contact with clay, mud and inorganic particles. All these particles are brought into the lake as suspended particles present in water. Water was also found more turbid during the month of May and June. This may be due to evaporation of water and shrinkage in water spread area.

Islam (2007) reported in Pond of Rajshahi University that the air and water temperature showed positive relationship (r=0.98). Similar results were observed (r=0.64) in Lakshmi theertham (2011 to 2012) and (r=0.71) in Saravana poigai (2009 to 2010). The temperature of water at various depths is influenced in general by the season variables. DO showed negative relationship with water temperature (r= -0.44) similar results were seen (r= -0.34) in Saravana poigai (2009 to 2010) and (r= -0.61) during (2010 to 2011) was found in the study period, which fully agree with the observations of earlier workers. So the interactions and interrelationships of various parameters seemed to contribute to the characteristics of the pond besides the influences of seasonal changes and lead to the conclusion that the favorable physical, chemical and nutrient characteristics of water could promote the productivity and phyto and zooplankton count.

References

Adoni AD, Joshi G, Gosh K, Chowasia SK, Vaishya AK and Yadav M 1985 Work book on Limnology, Prathibha Publishers, Sagar, India. pp 216

Bahura, CK 1998 A study of physico chemical characteristics of a highly eutrophic temple tank Bikaner. *J. Aqua. Bio.* 13(1&2): 47-51

Carpenter, S.R., E.H. Stanley, M.J. Vander Zanden, 2011 State of the world's freshwater ecosystems: physical, chemical and biological changes. In: *Annual Review of Environment & Resources.* pp 75-99

Islam SN 2007 Physico-chemical condition and occurrence of some zooplankton in a pond of Rajshahi University. *Res. J. Fisheries & Hydrobiol.* 2(2): 21-25

Kothari CR 2004 Research Methodology. Methods and Techniques, New Age International Publication, India. 2nd Edi. pp 100-101

Makode,P.M., A.P. Charjan, 2010 Correlation of biotic and abiotic factors in lakes of Chikhaldara, Melghat region. *Biosci. Biotech. Res. Comm.* 3(1): 43-49

Manoharan, D., L. Isaiarasu and R. Sureshkumar 2014 Cluster analysis of physical, chemical and nutrient parameters of three freshwater temple ponds at Thirupparankundram near Madurai, Tamil Nadu, India. *Inter. J. Fauna & Biol. Stud.* 1(6): 121-125

Prakash C 1982 Water quality of Keetham Lake (Soor sarovar). *J. Envi. Bio.* 4(4): 193-200

Rajagopal,T., A. Thangamani, G. Archunan, (2010) Comparison of physico-chemical parameters and phytoplankton species diversity of two perennial ponds in Sattur area, Tamilnadu. *J. Enviro. Biol.* 31(5): 784-794

Sharma,L.L., M. Sarang, 2004 Physicochemical limnology and productivity of Lake Jaisamand (Udaipur). *Poll. Res*. 23(1): 87-92

Sharma,V., M.S., Sharma, H., Malara, R. Sharma, S.B. Brijraj 2008 Trophic status and zooplankton diversity of Lake Jaisamand in relation to its physico-chemical characteristics. In: Sengupta, M. and R. Dalwani (Eds.), *Proceeding of Taal the 12th World Lake Conference,* Jaipur, India, pp 490-495

Tamlurkar,H.L., N.E. Ambore, 2006 Correlation co-efficient of some physico-chemical characteristics of Alisagar dam water, Nizamabad, AP. *J. Aqu. Biol.* 21(2): 115-118

Tidame, S.K, S.S. Shinde (2012) Report on correlation of zooplankton with physico- chemical factors from freshwater temple pond. *J. Experi. Sci.* 3(7): 13-16

Trivedy,P., A. Bajpai, S. Thareja, 2009 Evaluation of water quality: Physico-chemical characteristics of Ganga River at Kanpur by using correlation study. *Nature and Sci.* 1(6)

Welch, P.S. 1952 Limnology: McGraw Hill Book Company, New York, Toronto and London (2nd ed.), p538

Table 1. Correlation coefficient values among certain physical, chemical and nutrient parameters in Kasi theertham during September 2009 to August 2010.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1														
2	0.81	1													
3	0.47	0.45	1												
4	-0.86	-0.74	-0.34	1											
5	0.37	0.02	0.37	-0.07	1										
6	0.46	0.35	-0.09	-0.37	-0.12	1									
7	-0.47	-0.46	0.00	0.29	-0.03	-0.51	1								
8	-0.03	-0.36	-0.04	0.15	0.37	0.51	0.11	1							
9	0.76	0.82	0.52	-0.50	0.08	0.43	-0.55	-0.25	1						
10	-0.15	-0.01	0.07	0.42	-0.23	0.31	-0.02	0.16	0.35	1					
11	0.66	0.50	0.38	-0.36	0.40	0.32	-0.44	-0.04	0.77	0.13	1				
12	0.50	0.24	0.51	-0.47	0.33	0.21	-0.05	0.30	0.21	-0.17	0.28	1			
13	0.68	0.57	0.06	-0.77	0.12	0.45	-0.40	0.10	0.25	-0.56	0.30	0.42	1		
14	0.49	0.40	0.12	-0.52	0.37	-0.25	0.29	-0.20	0.07	-0.51	0.15	0.15	0.49	1	
15	0.78	0.64	0.43	-0.86	0.24	0.07	-0.17	-0.18	0.36	-0.57	0.34	0.56	0.80	0.70	1

Table 2. Correlation coefficient values among certain physical, chemical and nutrient parameters in Kasi theertham during September 2010 to August 2011.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1														
2	0.52	1													
3	-0.22	0.20	1												
4	0.18	0.16	-0.09	1											
5	-0.01	-0.28	0.32	-0.20	1										
6	0.71	0.13	-0.05	-0.08	0.07	1									
7	0.54	0.42	-0.39	0.22	0.18	0.20	1								
8	-0.16	-0.07	0.19	-0.17	-0.12	-0.13	-0.45	1							
9	0.37	-0.07	0.19	-0.46	0.40	0.70	0.08	-0.34	1						
10	0.79	0.39	0.23	-0.05	0.41	0.70	0.41	-0.02	0.63	1					
11	0.57	0.18	0.26	-0.21	0.49	0.57	0.08	-0.02	0.73	0.81	1				
12	0.11	0.35	-0.07	-0.04	0.30	-0.22	0.34	-0.16	-0.27	-0.05	-0.08	1			
13	0.55	0.25	-0.61	0.37	-0.30	0.22	0.62	0.07	-0.34	0.20	-0.26	0.13	1		
14	0.42	0.27	-0.38	0.15	-0.47	0.03	0.03	0.18	-0.39	-0.07	-0.17	0.33	0.51	1	
15	0.79	0.68	-0.33	0.26	-0.22	0.43	0.64	0.00	-0.12	0.48	0.09	0.38	0.81	0.52	1

1-Air temperature; 2-Water temperature; 3-pH; 4-Total Filterable Residue; 5-Alkalinity; 6-Free Carbon di- oxide; 7-Dissolved Oxygen; 8-Salinity; 9-Total hardness; 10-Calcium; 11-Magnesium; 12-Chloride; 13- Phosphate; 14-Sulphate; 15-Nitrate.

Table 3. Correlation coefficient values among certain physical, chemical and nutrient parameters in Kasi theertham during September 2011 to August 2012.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1														
2	0.45	1													
3	-0.42	-0.17	1												
4	-0.73	-0.45	0.36	1											
5	0.56	0.33	0.11	-0.59	1										
6	-0.03	-0.51	0.07	0.11	-0.21	1									
7	-0.02	-0.45	0.14	0.07	0.03	0.45	1								
8	-0.05	-0.10	-0.43	0.26	-0.24	-0.31	0.33	1							
9	0.04	0.27	0.21	-0.15	0.35	-0.48	-0.72	-0.41	1						
10	0.07	-0.05	0.10	-0.06	0.35	-0.05	-0.14	-0.24	0.58	1					
11	0.08	0.39	0.39	-0.20	0.62	-0.42	-0.34	-0.23	0.67	0.36	1				
12	0.48	-0.02	-0.54	-0.37	-0.24	0.34	0.38	0.29	-0.52	-0.36	-0.42	1			
13	0.32	-0.21	-0.04	-0.36	0.48	-0.05	0.22	0.11	-0.13	-0.33	0.23	0.18	1		
14	0.56	0.23	-0.51	-0.70	0.37	0.10	0.21	0.13	-0.40	-0.29	-0.23	0.39	0.41	1	
15	0.79	0.46	-0.52	-0.81	0.35	-0.17	-0.06	0.10	-0.07	-0.08	0.06	0.55	0.38	0.71	1

Table 4. Correlation coefficient values among certain physical, chemical and nutrient parameters in Lakshmi theertham during September 2009 to August 2010.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1														
2	-0.11	1													
3	-0.24	0.30	1												
4	0.37	0.23	-0.15	1											
5	0.22	0.32	-0.09	0.09	1										
6	0.40	-0.08	-0.22	-0.25	0.49	1									
7	0.68	0.19	-0.21	0.33	0.30	0.37	1								
8	0.46	0.15	-0.57	0.38	0.37	0.46	0.31	1							
9	0.49	0.00	-0.13	0.25	0.50	0.40	0.45	0.34	1						
10	0.37	0.02	0.17	0.29	-0.40	-0.56	0.17	-0.28	-0.21	1					
11	0.01	-0.10	-0.47	-0.07	0.51	0.64	0.03	0.52	0.52	-0.88	1				
12	0.01	0.34	0.03	0.37	0.12	-0.38	0.11	-0.34	0.01	0.30	-0.18	1			
13	0.10	0.44	-0.11	-0.02	0.20	0.20	0.47	0.05	0.40	-0.03	0.13	0.41	1		
14	0.31	0.02	-0.11	0.48	-0.57	-0.38	0.44	-0.13	-0.18	0.68	-0.57	0.26	0.08	1	
15	0.40	0.47	-0.07	0.26	-0.24	0.10	0.65	0.31	0.01	0.31	-0.24	0.03	0.48	0.64	1

1-Air temperature; 2-Water temperature; 3-pH; 4-Total Filterable Residue; 5-Alkalinity; 6-Free Carbon di- oxide; 7-Dissolved Oxygen; 8-Salinity; 9-Total hardness; 10-Calcium; 11-Magnesium; 12-Chloride; 13- Phosphate; 14-Sulphate; 15-Nitrate

Table 5. Correlation coefficient values among certain physical, chemical and nutrient parameters in Lakshmi theertham during September 2010 to August 2011.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1														
2	0.38	1													
3	-0.44	-0.30	1												
4	0.16	-0.57	-0.33	1											
5	-0.39	-0.13	0.21	0.19	1										
6	0.42	0.11	-0.11	-0.18	-0.93	1									
7	0.12	0.17	-0.34	0.27	-0.12	0.10	1								
8	0.31	-0.22	-0.07	0.31	0.20	-0.08	0.40	1							
9	0.48	0.31	-0.47	0.35	-0.32	0.28	0.62	0.10	1						
10	-0.09	-0.05	-0.12	0.08	0.60	-0.55	-0.61	-0.03	-0.53	1					
11	0.17	-0.02	0.19	-0.01	-0.51	0.44	0.44	0.02	0.56	-0.90	1				
12	0.37	0.26	-0.15	0.29	-0.01	0.05	0.59	0.25	0.62	-0.50	0.45	1			
13	0.66	-0.14	-0.38	0.64	-0.22	0.35	0.18	0.33	0.58	-0.04	0.14	0.23	1		
14	-0.02	0.05	-0.41	0.61	0.59	-0.59	0.27	0.00	0.37	0.32	-0.24	0.39	0.26	1	
15	0.54	0.32	-0.55	0.45	-0.24	0.32	0.48	0.03	0.86	-0.26	0.24	0.60	0.74	0.51	1

Table 6. Correlation coefficient values among certain physical, chemical and nutrient parameters in Lakshmi theertham during September 2011 to August 2012.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1														
2	0.64	1													
3	-0.48	0.01	1												
4	0.44	0.22	-0.56	1											
5	0.40	0.23	0.15	0.18	1										
6	0.55	0.47	-0.13	0.47	0.52	1									
7	0.55	0.25	-0.20	0.38	0.69	0.78	1								
8	-0.09	0.01	0.43	-0.46	0.22	-0.09	0.16	1							
9	0.25	0.23	0.22	-0.28	0.29	0.44	0.15	0.11	1						
10	0.58	0.58	-0.35	0.68	0.19	0.72	0.63	-0.13	-0.06	1					
11	0.46	0.05	0.06	-0.24	0.61	0.28	0.61	0.51	0.41	-0.03	1				
12	0.48	0.56	-0.17	0.20	0.58	0.33	0.50	0.04	0.21	0.28	0.35	1			
13	0.56	0.30	-0.52	0.33	-0.17	0.38	0.05	-0.19	0.47	0.31	-0.03	0.08	1		
14	0.05	0.28	0.01	0.50	-0.22	0.43	0.13	-0.10	0.03	0.67	-0.45	-0.14	0.41	1	
15	0.08	0.22	-0.14	0.37	0.21	0.31	0.46	0.23	-0.25	0.31	0.07	0.54	-0.01	0.18	1

Table 7. Correlation coefficient values among certain physical, chemical and nutrient parameters in Saravana poigai during September 2009 to August 2010.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1														
2	0.71	1													
3	-0.36	-0.28	1												
4	-0.39	0.08	0.03	1											
5	0.68	0.24	-0.20	-0.35	1										
6	-0.02	0.20	-0.14	0.29	-0.60	1									
7	-0.06	-0.34	0.20	-0.48	0.53	-0.93	1								
8	-0.15	-0.20	0.27	0.11	-0.37	0.37	-0.22	1							
9	0.57	0.35	-0.15	0.16	0.83	-0.41	0.22	-0.20	1						
10	0.64	0.40	0.00	-0.19	0.62	-0.23	0.10	0.09	0.69	1					
11	0.28	-0.20	0.01	-0.47	0.28	-0.01	0.17	-0.30	-0.13	-0.18	1				
12	0.21	-0.04	0.27	-0.66	0.29	-0.08	0.34	0.19	-0.04	0.36	0.37	1			
13	0.60	0.47	0.10	-0.46	0.59	-0.23	0.30	-0.16	0.38	0.53	0.32	0.68	1		
14	0.50	0.01	-0.01	-0.87	0.64	-0.47	0.60	-0.04	0.25	0.47	0.35	0.69	0.68	1	
15	0.55	0.14	-0.09	-0.63	0.86	-0.67	0.67	-0.18	0.62	0.64	0.11	0.49	0.62	0.88	1

Table 8. Correlation coefficient values among certain physical, chemical and nutrient parameters in Saravana poigai during September 2010 to August 2011.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1														
2	0.31	1													
3	0.20	0.16	1												
4	-0.56	0.05	-0.29	1											
5	0.46	0.31	-0.19	-0.58	1										
6	-0.38	0.42	-0.12	0.52	-0.01	1									
7	-0.13	-0.61	0.21	-0.34	-0.22	-0.68	1								
8	-0.18	0.13	0.14	0.55	-0.26	0.17	-0.20	1							
9	0.43	0.71	-0.17	-0.03	0.68	0.41	-0.70	0.18	1						
10	0.60	0.57	-0.14	-0.41	0.43	-0.07	-0.30	-0.53	0.45	1					
11	0.47	0.45	-0.07	0.15	0.23	0.33	-0.78	0.34	0.72	0.36	1				
12	0.21	-0.01	0.03	0.02	0.40	-0.20	0.04	0.53	0.28	-0.38	0.07	1			
13	0.13	-0.09	-0.44	-0.33	0.63	-0.16	-0.05	-0.23	0.13	0.14	-0.11	0.43	1		
14	0.65	0.30	-0.22	-0.55	0.62	-0.17	0.05	-0.26	0.49	0.54	0.15	0.08	0.18	1	
15	0.76	0.55	-0.24	-0.20	0.57	0.18	-0.45	-0.23	0.65	0.66	0.48	0.07	0.18	0.72	1

1-Air temperature; 2-Water temperature; 3-pH; 4-Total Filterable Residue; 5-Alkalinity; 6-Free Carbon di- oxide; 7-Dissolved Oxygen; 8-Salinity; 9-Total hardness; 10-Calcium; 11-Magnesium; 12-Chloride; 13- Phosphate; 14-Sulphate; 15-Nitrate

Table 9. Correlation coefficient values among certain physical, chemical and nutrient parameters in Saravana poigai during September 2011 to August 2012.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1														
2	0.30	1													
3	0.39	-0.05	1												
4	-0.41	0.15	0.20	1											
5	0.67	0.12	0.50	-0.05	1										
6	-0.50	0.14	-0.35	0.53	-0.28	1									
7	-0.06	-0.23	-0.14	-0.24	-0.38	-0.58	1								
8	0.69	0.06	0.07	-0.71	0.65	-0.45	-0.20	1							
9	0.62	0.29	0.21	0.12	0.85	-0.11	-0.40	0.55	1						
10	0.79	0.21	0.19	-0.01	0.81	-0.28	-0.24	0.61	0.86	1					
11	0.74	0.10	0.29	-0.35	0.78	-0.21	-0.40	0.86	0.75	0.64	1				
12	0.32	-0.41	0.40	-0.28	0.58	-0.14	-0.46	0.57	0.43	0.37	0.61	1			
13	0.46	-0.05	0.02	-0.75	0.27	-0.49	0.03	0.73	0.11	0.15	0.51	0.40	1		
14	0.52	-0.17	-0.13	-0.72	0.39	-0.39	-0.09	0.70	0.29	0.22	0.52	0.47	0.71	1	
15	0.20	-0.42	-0.21	-0.68	0.27	-0.37	0.03	0.59	0.05	0.27	0.27	0.36	0.33	0.63	1

1-Air temperature; 2-Water temperature; 3-pH; 4-Total Filterable Residue; 5-Alkalinity; 6-Free Carbon di- oxide; 7-Dissolved Oxygen; 8-Salinity; 9-Total hardness; 10-Calcium; 11-Magnesium; 12-Chloride; 13- Phosphate; 14-Sulphate; 15-Nitrate.