Physicochemical And Correlation Studies In Saltpans At Kelambakkam Coastal Area, Tamilnadu, India

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Abstract

Dynamic hyposaline ecosystem are influenced with variation in physicochemical parameters and flora and fauna in the extreme conditions. Therefore the present investigation was carried out in the Kelabakkam saltpans (such as Reservior tank, Evaporation tank and Consation tank). About five samples were collected from each sites and were subjected to various physico chemical parameters and correlation studies were carried out as per standard methods and the results are tabulated and interpreted. The pH, temperature and salinity ranged from 6.38 to 8.11, 21^0C to 28.8^0C and 35 psu to 215 psu, respectively during the study period. The texture of the sediment samples was mostly sandy clay loam and considerable amount of heavy metals was present in all the samples. The texture of soil were sand, silt and clay wherein sand ranged from 59.7% to 71.9%, silt from 21.5% to 29.4% and clay from 6.4% to 11.9%, respectively. The correlation co-efficient analysis of physicochemical properties of the sediment samples of reservoir (site Nos. 1 to 6), crystallization (site Nos. 7 to 11) and evaporation (site Nos. 12 to 18) ponds in the Kelambakkam saltpan revealed that there was significant positive correlation between them during the period of study.

Keywords: Saltpans, Physico chemical, salinity, specific gravity, correlation, co efficient

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Introduction

Hypersaline environment originates due to high evaporation of sea water (marshes, salt pans, salt lakes) and show greater variability in terms of total salt concentration, pH, ionic composition nutrient concentrations, microbial communities etc. [1-3]. Natural salt pans or salt flats are ground covered with salt and other minerals formed due to evaporation of water pool (eg. Lake or pool). This conditions occurs where water evaporation exceeds the rate of precipitation (eg. desert) over thousands of years where the minerals reflects the sun's rays and appears as white [4-6]. The dynamic ecosystem a vulnerable physico-chemical variations and results in saturation with sodium chloride [7,8] and the organisms adapt themselves to these extreme conditions [9]. The sediment physical properties (specific gravity, bulk density, texture, colour etc.) were analysed as per standard methods [10] and other properties such as pH, temperature, salinity, alkalinity, conductivity, phosperus, sodium, potassium and calcium [11].

Study area

Kelambakkam saltpan is the one of the important solar salt works ecosystem located at latitude (N) 12˚46'22.45' and longitude (E) 80˚13'27.43' about 35 km away from Chennai along the East Coast of the Bay of Bengal, Tamil Nadu, India with a total area of 1305 acres (Fig. 1).

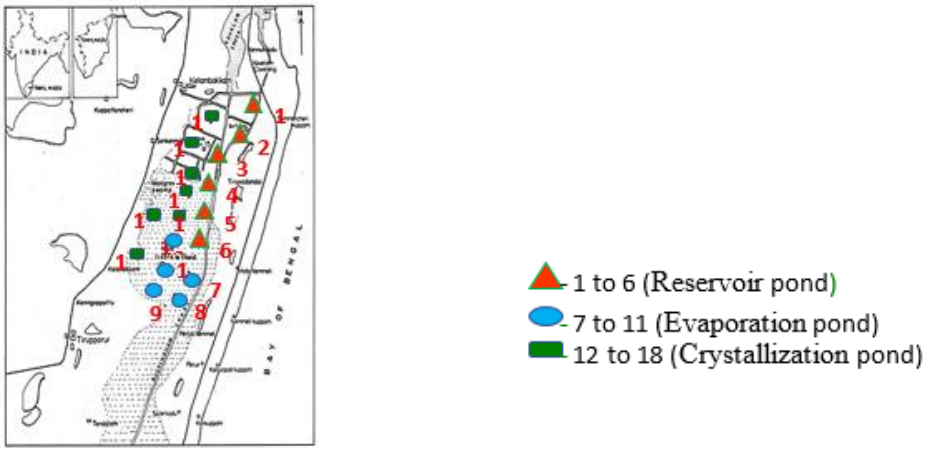

Fig. 1: Sampling sites in Kelambakkam Salt pan

Sample collection

Totally, 5 sediment samples were collected from various sites of Kelambakkam saltpan such as reservoir pond (Site No. 1 to 6), evaporation pond (Site No. 7 to 11) and crystallization pond (Site No. 12 to 18) (Fig. 2) during the month of September 2020. The sediment samples were taken at the depth of 10 cm in all the sites. At each site, three individual soil samples were taken from different locations, which were mixed to obtain a composite sample of the site. The water temperature was measured using a standard thermometer. Salinity was measured using Baume (˚Be) hydrometer and the results were cross checked with digital refractometer (PAL-06, Atago, Japan). The pH was measured by Elico pH meter. The different sediment samples were collected in sterile poly propylene bags using sterile spatula.

(1) Reservoir Pond (2) Evaporation Pond (3) Crystallization Pond

Fig 2: Sample Sites during the investigation (Site No. 1) Reservoir pond,(Site No. 2) Evaporation pond and ,(Site No. 3) Crystallization Pond

Physiochemical properties of the sediment samples

Totally 5 sediment samples were collected from different sites of reservoir, crystallization and evaporation ponds in the Kelambakkam saltpan. The pH of the samples was varied from 7.8 to 8.2 and the highest pH was recorded in the site no. 5 (Fig.3). Reports revealed that there was no significant change in the pH and ranged from 6.38 to 8.11 [8, 12-14]. The pH ranged from 7.8 to 8.6 in Thondi coastal environment [15] and from 6.02 to 7.89 in Bhitar kanika [16]. The temperature of water samples varied from 13˚C to 34˚C and the maximum was recorded in the site No. 5, while the minimum was in the site no. 1 (Fig.4). The tewmperature ranged from 21^0C to 28.8^0C where low temperature was recorded in the winter and high intensity of solar radiation with high evaporation rate [17-19] and temperature varied from 30^0C to 32^0C [8, 20]. The salinity of the sediment samples was ranged from 35 psu to 215 psu and the maximum was recorded in the site no. 5 (Fig.5). Very high salinity was registered during season III (low rainfall and high rate of evaporation) and low salinity during winter during the period of study [8] and the rainfall caused dilution of salt due to reduced salinity [18,19].

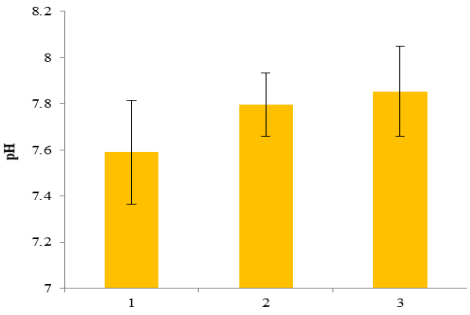

Fig. 3: Mean value of pH at the sample sites (Site No. 1) Reservoir pond, (Site No. 2) Evaporation pond and (Site No. 3) Crystallization Pond

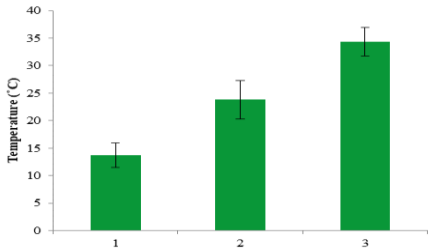

Fig. 4: Mean value of Temperature at the sample sites (Site No. 1) Reservoir pond, (Site No. 2) Evaporation pond and (Site No. 3) Crystallization Pond

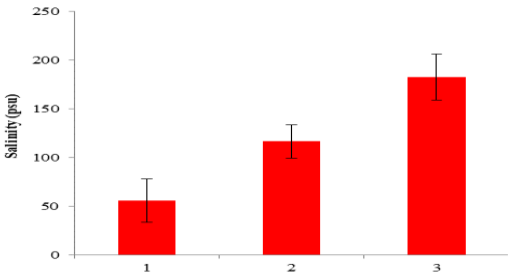

Fig. 5: Mean value of salinity at the sample sites (Site No. 1) Reservoir pond, (Site No. 2) Evaporation pond and (Site No. 3) Crystallization Pond

The texture of the sediment samples was mostly sandy clay loam and considerable amount of heavy metals was present in all the samples. The texture of soil were sand, silt and clay wherein sand ranged from 59.7% to 71.9%, silt from 21.5% to 29.4% and clay from 6.4% to 11.9%, respectively [21]. Calcium was high (15.6%) in the site No. 15, magnesium was high (14.2%) in the site 10, sodium was high (24.5%) in the site No. 18, potassium was high (0.26%) in the site No. 4, organic carbon (OC) was high (0.48%) in the site No. 4, nitrate, was high (0.982%) in the site No. 4 and phosphorus, was high (0.035) in the site No. 16. Further, copper, was high (1.05 ppm) in the site No. 1, zinc, was high (1.06 ppm) in the site No. 10, iron, was high (5.36 ppm) in the site No. 12 and manganese was high (2.78 ppm) in the site No. 11. The percentage of soil fractions such as fine sand, coarse sand, silt and clay was analyzed and the results showed that the fine sand particles were high (48.62%) in the site No. 5, coarse sand was high (28.65%) in the site No. 14, silt sand was high (29.43%) in the site No. 6 and clay sand was the (17.25%) in the site No. 11. Presence of calcium in an ecosystem determines the metabolism and growth of flora and the concentration increases during summer and relatively low during autum and spring [12]. Calcium and sulphate concentration was maximum during summer and minimum during spring [22] and

magnesium was minimum during summer [23]. The variations in concentration of sodium, potassium, calcium and magnesium is only by evaporation loss [24].

The correlation co-efficient analysis of physicochemical properties of the sediment samples of reservoir (site Nos. 1 to 6), crystallization (site Nos. 7 to 11) and evaporation (site Nos. 12 to 18) ponds in the Kelambakkam saltpan revealed that there was significant positive correlation between them. All the collected 5 sediment samples (reservoir pond (site No. 1 to 6), evaporation pond (site No. 7 to 11) and crystallization pond (site No. 12 to 18)) were subjected for various physiochemical analyses and also for sediment texture and metals. Textural studies on the sediments were performed for sand, silt and clay distribution. The organic carbon was determined by exothermic heating and oxidation with potassium dichromate and concentrated H_2SO_4, followed by titration of excess dichromate with 0.5 N ferrous ammonium sulphate solution. For total metal analysis, the sediments were dried at 50-60˚C in an oven and disaggregated in an agate mortar, before chemical treatment. For each sample, a known quantity (1 g) of sediment was digested with a solution of concentrated $HClO_4$ (1 ml) and HF (10 ml) and the mixture was evaporated to near dryness. Finally, $HClO_4$ alone was added and the sample was evaporated until white fumes appeared. The residue was dissolved in concentrated HCl and diluted to 25 ml with water. The presence of metals (Iron, Manganese, Copper and Zinc) were measured using a flame atomic absorption spectrophotometer (Perkin-Elmer AA700) equipped with a deuterium background corrector.

Statistical analysis showed a positive correlation among the physico-chemical variants such as pH ($r = 0.415057$; $P<0.05$), phosphorus ($r = 0.219387$; $P<0.05$), zinc ($r = 0.001759$; $P<0.05$), iron ($r = 0.549231$; $P<0.05$), sodium ($r = 0.822374$; $P<0.05$) and silt ($r = 0.638573$; $P<0.05$) with the increase in salinity. However, negative correlation was obtained for organic carbon ($r = -0.23539$; $P<0.05$), nitrate ($r = -0.09356$; $P<0.05$), copper ($r = -0.27077$; $P<0.05$), manganese ($r = -0.2102$; $P<0.05$), calcium ($r = -0.09001$; $P<0.05$), potassium ($r = -0.2355$; $P<0.05$), magnesium ($r = -0.05991$; $P<0.05$), fine sand ($r = -0.08602$; $P<0.05$), coarse sand ($r = -0.64883$; $P<0.05$) and clay ($r = -0.52734$; $P<0.05$) with the increase in salinity in the reservoir pond.

Similarly, pH ($r = 0.997891$; $P<0.05$), nitrate ($r = 0.936899$; $P<0.05$), phosphorus ($r = 0.246598$; $P<0.05$), zinc ($r = 0.066066$; $P<0.05$), copper ($r = 0.878962$; $P<0.05$), iron ($r = 0.911685$; $P<0.05$), manganese ($r = 0.276146$; $P<0.05$), sodium ($r = 0.947948$; $P<0.05$), calcium ($r = 0.446134$; $P<0.05$), magnesium ($r = 0.721601$; $P<0.05$), silt ($r = 0.190029$; $P<0.05$) and clay ($r = 0.768169$; $P<0.05$) with the increase in salinity. However, negative correlation was obtained for organic carbon ($r = -0.0513$; $P<0.05$), potassium ($r = -0.72219$; $P<0.05$), fine sand ($r = -0.58687$; $P<0.05$) and coarse sand ($r = -0.78016$; $P<0.05$) with the increase in salinity in the evaporation pond.

On the other hand, the physico-chemical variants of the crystallization pond showed a positive correlation of pH ($r = 0.997891$; $P<0.05$), nitrate ($r = 0.936899$; $P<0.05$), phosphorus ($r = 0.246598$; $P<0.05$), zinc ($r = 0.066066$; $P<0.05$), copper ($r = 0.878962$; $P<0.05$), iron ($r = 0.911685$; $P<0.05$), manganese ($r = 0.276146$; $P<0.05$), sodium ($r = 0.947948$; $P<0.05$), calcium ($r = 0.446134$; $P<0.05$), magnesium ($r = 0.721601$; $P<0.05$), silt ($r = 0.190029$; $P<0.05$) and clay ($r = 0.768169$; $P<0.05$) with the increase in salinity. However, negative correlation was obtained for organic carbon ($r = -0.0513$; $P<0.05$), potassium ($r = -0.72219$; $P<0.05$), fine sand ($r = -0.58687$; $P<0.05$) and coarse sand ($r = -0.78016$; $P<0.05$) with the increase in salinity.

Table 1:Mean values of physiochemical properties from three sample sites of Kelambakkam saltpan, Tamil Nadu, India

Pond	Site No.	pH	Colour	Texture	Heavy metals	Lime status	Salinity (psu)	Organic carbon (%)	Fine sand (%)	Coarse sand (%)	Silt (%)	Clay (%)
Reservoir pond	1	7.35± 0.05	Blackish Brown	Sandy Clay loam	Present	Nil	35±1.00	0.36±0.01	41.25±0.026	23.48±0.01	20.56±0.01	14.71±0.015
	2	7.47±0.05	Blackish Brown	Sandy clay loam	Present	Nil	41±1.00	0.48±0.01	41.36±0.02	21.05±0.01	21.58±0.0	16.01±0.035
Evaporation pond	3	7.82±0.07	Blackish Brown	Sandy clay loam	Present	Nil	94.33±1.52	0.36±0.01	42.06±0.0	23.54±0.032	21.75±0.01	12.65±0.032
Crystallization pond	4	8.06±0.145	Blackish Brown	Sandy clay loam	Present	Nil	149.3±2.00	0.29±0.01	40.25±0.01	23.56±0.04	26.41±0.03	9.78±0.03
	5	7.58±0.047	Blackish Brown	Sandy clay loam	Present	Nil	160.33±1.00	0.39±0.01	42.36±0.03	21.69±0.01	24.86±0.01	11.09±0.02

Table 2: Mean values of micronutrients and macronutrients from three sample sites of Kelambakkam saltpan, Tamil Nadu, India

Pond	Site No.	Micronutrients				Macronutrients						
		Zinc	Copper	Iron	Manganese	Nitrate	Sodium	Calcium	Magnesium	Phosphorous	Potassium	Zinc
Reservoir pond	1	0.96±0.01	1.05±0.01	4.06±0.01	2.36±0.01	0.845±0.006	1.28±0.01	1.3±0.023	1.12±0.01	0.026±0.002	0.25±0.01	0.96±0.01
	2	0.826±0.00058	0.95±0.01	4.13±0.005	2.45±0.01	0.826±0.007	1.36±0.01	1.26±0.002	1.19±0.01	0.029±0.002	0.18±0.01	0.826±0.00
Evaporation pond	3	1.06±0.005	0.72±0.005	4.26±0.02	2.36±0.03	0.763±0.002	2.06±0.005	1.4±0.01	1.45±0.02	0.025±0.001	0.16±0.01	1.06±0.005
Crystallization pond	4	0.59±0.01	0.89±0.01	4.26±0.01	2.36±0.01	0.613±0.001	2.36±0.01	1.09±0.01	0.92±0.02	0.025±0.001	0.23±0.01	0.59±0.01
	5	0.96±0.01	0.89±0.02	4.28±0.04	2.16±0.03	0.621±0.001	2.45±0.03	1.15±0.01	0.95±0.01	0.026±0.001	0.21±0.01	0.96±0.01

Table 3: Correlation analysis of physicochemical variants of the reservoir pond in the Kelambakkam saltpan

	Temperature	Salinity	pH	Organic Carbon	Nitrate	Phosphorus	Zinc	Copper	Iron	Manganese	Sodium	Calcium	Potassium	Magnesium	Fine sand	Coarse sand	Silt	Clay
Temperature	1																	
Salinity	0.9750	1																
pH	0.5032	0.41505	1															
Organic carbon	-0.2758	-0.2353	0.4595	1														
Nitrate	-0.0322	-0.0935	0.3761	0.3624	1													
Phosphorus	0.3234	0.2193	0.5047	0.3016	0.8232	1												
Zinc	0.1626	0.0017	-0.0778	-0.4175	0.3665	0.6117	1											
Copper	-0.1938	-0.2707	-0.5483	-0.5456	-0.6060	-0.3488	0.4380	1										
Iron	0.3758	0.5492	-0.4044	-0.3770	-0.4014	-0.4024	-0.3633	-0.1183	1									
Manganese	-0.2520	-0.2102	-0.0004	0.4114	0.8643	0.5848	0.1271	-0.6226	-0.0769	1								
Sodium	0.7363	0.8223	-0.2646	0.0586	0.0330	0.0518	-0.4545	-0.6858	0.5548	0.0006	1							
Calcium	-0.0789	-0.0900	-0.2646	-0.1024	0.7358	0.6212	0.5910	-0.1929	0.01714	0.8166	-0.1866	1						
Potassium	-0.2829	-0.2355	-0.2631	-0.2375	0.4526	-0.0595	-0.0590	-0.4138	0.1804	0.5715	0.08502	0.5263	1					
Magnesium	-0.2520	-0.0599	0.0228	0.1595	0.7529	0.8704	0.7321	-0.0905	-0.3050	0.6938	-0.29245	0.8518	0.0616	1				
Fine sand	-0.1721	-0.0860	-0.1829	-0.0832	-0.8533	-0.9255	-0.7261	0.2489	0.2789	-0.7147	0.0973	-0.8641	-0.2024	-0.9572	1			
Coarse sand	-0.5943	-0.6488	-0.3117	-0.3024	-0.3955	-0.6533	-0.1244	0.4798	-0.3325	-0.4418	-0.5185	-0.4100	0.2043	-0.5459	0.5635	1		
Silt	0.7018	0.6385	0.6992	0.1629	0.6764	0.8457	-0.1244	-0.5820	-0.0655	0.4111	0.5558	0.4034	0.5446	0.5446	-0.7143	-0.7467	1	
Clay	-0.5350	-0.5273	-0.6386	0.0224	0.3112	0.2709	0.3440	0.2937	-0.1137	0.5441	-0.6975	0.7268	0.1589	0.7029	-0.5181	-0.1067	-0.1872	1

Table4: Correlation analysis of physicochemical variants of the evaporation pond in the Kelambakkam saltpan

	Temperature	Salinity	pH	Organic Carbon	Nitrogen	Phosphorus	Zinc	Copper	Iron	Manganese	Sodium	Calcium	Potassium	Magnesium	Fine sand	Coarse sand	Silt	Clay
Temperature	1																	
Salinity	0.995893	1																
pH	0.987916	0.997891	1															
Organic carbon	-0.04644	-0.0513	-0.05452	1														
Nitrate	0.909011	0.936899	0.95216	-0.16192	1													
Phosphorus	0.193492	0.246598	0.28343	-0.42167	0.560916	1												
Zinc	0.103676	0.066066	0.038765	-0.73431	-0.07569	-0.27877	1											
Copper	0.864598	0.878962	0.884818	0.255915	0.753872	-0.06639	-0.05127	1										
Iron	0.920837	0.911685	0.900515	-0.39461	0.82204	0.177983	0.4624	0.725534	1									
Manganese	0.216486	0.276146	0.317526	0.019317	0.568098	0.896612	-0.65774	0.096313	0.03147	1								
Sodium	0.947976	0.947948	0.943138	0.254252	0.865301	0.157424	-0.19329	0.888879	0.749347	0.319756	1							
Calcium	0.491821	0.446134	0.411122	-0.6462	0.408779	0.271804	0.581972	0.01995	0.666924	-0.03525	0.278574	1						
Potassium	-0.67167	-0.72219	-0.75476	-0.1684	-0.71411	-0.12952	0.154702	-0.90147	-0.5574	-0.28184	-0.69628	0.227429	1					
Magnesium	0.699552	0.721601	0.733763	-0.70291	0.78607	0.509178	0.484409	0.477283	0.870387	0.250051	0.47145	0.620882	-0.50143	1				
Fine sand	-0.51704	-0.58687	-0.63397	0.351233	-0.8054	-0.77898	0.130893	-0.46743	-0.50878	-0.72626	-0.45193	-0.10152	0.693446	-0.75833	1			
Coarse sand	-0.73056	-0.78016	-0.81177	0.423809	-0.90645	-0.63508	-0.09909	-0.63043	-0.76342	-0.53465	-0.61086	-0.31812	0.742565	-0.90543	0.943514	1		
Silt	0.12424	0.190029	0.23624	-0.61317	0.353518	0.434984	0.318365	0.199386	0.325499	0.227765	-0.05516	-0.03403	-0.51847	0.682438	-0.75639	-0.71387	1	
Clay	0.714182	0.768169	0.802996	-0.26998	0.936409	0.747274	-0.14783	0.599783	0.6582	0.725717	0.664439	0.253375	-0.71325	0.791926	-0.95961	-0.96342	0.581911	1

Table 5: Correlation analysis of physicochemical variants of the reservoir pond in the Kelambakkam saltpan

	Temperature	Salinity	pH	Organic Carbon	Nitrate	Phosphorus	Zinc	Copper	Iron	Manganese	Sodium	Calcium	Potassium	Magnesium	Fine sand	Coarse sand	Silt	Clay
Temperature	1																	
Salinity	0.9750	1																
pH	0.5032	0.41505	1															
Organic carbon	-0.2758	-0.2353	0.4595	1														
Nitrate	-0.0322	-0.0935	0.3761	0.3624	1													
Phosphorus	0.3234	0.2193	0.5047	0.3016	0.8232	1												
Zinc	0.1626	0.0017	-0.0778	-0.4175	0.3665	0.6117	1											
Copper	-0.1938	-0.2707	-0.5483	-0.5456	-0.6060	-0.3488	0.4380	1										
Iron	0.3758	0.5492	-0.4044	-0.3770	-0.4014	-0.4024	-0.3633	-0.1183	1									
Manganese	-0.2520	-0.2102	-0.0004	0.4114	0.8643	0.5848	0.1271	-0.6226	-0.0769	1								
Sodium	0.7363	0.8223	-0.2646	0.0586	0.0330	0.0518	-0.4545	-0.6858	0.5548	0.0006	1							
Calcium	-0.0789	-0.0900	-0.2646	-0.1024	0.7358	0.6212	0.5910	-0.1929	0.01714	0.8166	-0.1866	1						
Potassium	-0.2829	-0.2355	-0.2631	-0.2375	0.4526	-0.0595	-0.0590	-0.4138	0.1804	0.5715	0.08502	0.5263	1					
Magnesium	-0.2520	-0.0599	0.0228	0.1595	0.7529	0.8704	0.7321	-0.0905	-0.3050	0.6938	-0.29245	0.8518	0.0616	1				
Fine sand	-0.1721	-0.0860	-0.1829	-0.0832	-0.8533	-0.9255	-0.7261	0.2489	0.2789	-0.7147	0.0973	-0.8641	-0.2024	-0.9572	1			
Coarse sand	-0.5943	-0.6488	-0.3117	-0.3024	-0.3955	-0.6533	-0.1244	0.4798	-0.3325	-0.4418	-0.5185	-0.4100	0.2043	-0.5459	0.5635	1		
Silt	0.7018	0.6385	0.6992	0.1629	0.6764	0.8457	-0.1244	-0.5820	-0.0655	0.4111	0.5558	0.4034	0.5446	0.5446	-0.7143	-0.7467	1	
Clay	-0.5350	-0.5273	-0.6386	0.0224	0.3112	0.2709	0.3440	0.2937	-0.1137	0.5441	-0.6975	0.7268	0.1589	0.7029	-0.5181	-0.1067	-0.1872	1

Table6: Correlation analysis of physicochemical variants of the crystallization pond in the Kelambakkam saltpan

	Temperature	Salinity	pH	Organic carbon	Nitrate	Phosphorus	Zinc	Copper	Iron	Manganese	Sodium	Calcium	Potassium	Magnesium	Fine sand	Coarse and	Silt	Clay
Temperature	1																	
Salinity	0.995893	1																
pH	0.987916	0.99789	1															
Organic carbon	-0.04644	-0.0513	-0.05452	1														
Nitrate	0.909011	0.93689	0.95216	-0.16192	1													
Phosphorus	0.193492	0.24659	0.28343	-0.42167	0.560916	1												
Zinc	0.103676	0.06606	0.03876	-0.73431	-0.07569	-0.27877	1											
Copper	0.864598	0.87896	0.88481	0.25591	0.753872	-0.06639	-0.05127	1										
Iron	0.920837	0.91168	0.90051	-0.39461	0.82204	0.177983	0.4624	0.725534	1									
Manganese	0.216486	0.27614	0.31752	0.01931	0.568098	0.896612	-0.65774	0.096313	0.03147	1								
Sodium	0.947976	0.94794	0.94313	0.25425	0.865301	0.157424	-0.19329	0.888879	0.749347	0.319756	1							
Calcium	0.491821	0.44613	0.41112	-0.6462	0.408779	0.271804	0.581972	0.01995	0.666924	-0.03525	0.27857	1						
Potassium	-0.67167	-0.72219	-0.75476	-0.1684	-0.71411	-0.12952	0.154702	-0.90147	-0.5574	-0.28184	-0.69628	0.227429	1					
Magnesium	0.699552	0.72160	0.73376	-0.70291	0.78607	0.509178	0.484409	0.477283	0.870387	0.250051	0.47145	0.620882	-0.50143	1				
Fine sand	-0.51704	-0.58687	-0.63397	0.35123	-0.8054	-0.77898	0.130893	-0.46743	-0.50878	-0.72626	-0.45193	-0.10152	0.693446	-0.75833	1			
Coarse sand	-0.73056	-0.7801	-0.81177	0.42380	-0.90645	-0.63508	-0.09909	-0.63043	-0.76342	-0.53465	-0.61086	-0.31812	0.742565	-0.90543	0.943514	1		
Silt	0.12424	0.19002	0.23624	-0.61317	0.353518	0.434984	0.318365	0.199386	0.325499	0.227765	-0.05516	-0.03403	-0.51847	0.682438	-0.75639	-0.713871		
Clay	0.714182	0.76816	0.80299	-0.26998	0.936409	0.747274	-0.14783	0.599783	0.6582	0.725717	0.66443	0.253375	-0.71325	0.791926	-0.95961	-0.963421	0.58191	1

Conclusion

Saltpan environment at Kelambakkam during the period of study showed significant variation in case of physico chemical parameters, heavy metals and had correlations between them. The micronutrients and macronutrients presence had influenced the distribution of microflora and microfauna during the investigation. Presence of calcium in an ecosystem determines the metabolism and growth of flora and the concentration increases during summer and relatively low during autum and spring.

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