



**Full Length Research Article**

**PHYSICO-CHEMICAL CHARACTERISTICS OF SOLAR SALTPANS IN KANYAKUMARI DISTRICT,  
TAMIL NADU**

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**ABSTRACT**

Sodium chloride (salt) is manufactured in solar saltpans. Salt, an inexpensive and abundant commodity, plays a prominent role in the development of man's activities. The most abundant source of common salt is sea water. It is manufactured by various methods, of which the solar evaporation of sea brine, backwater and sub-soil brine water is predominant. The physico-chemical features and biological systems are essential for the proper functioning of saltpans. This paper explains the physico-chemical parameters of brine at various stages i.e., (1) reservoir, (2) condenser and (3) crystallizer of the different saltpans in Kanyakumari district saltpans. This study provides baseline information of the physico-chemical parameters for further assessment and monitoring of this type of ecosystems.

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**INTRODUCTION**

Physico-chemical disturbances can affect the quality and quantity of salt (Coleman and White, 1992). High evaporation, dry wind, high temperature, and low rainfall rate these factors are helpful for good salt production (Calvinaco, 1990). The major chemicals found in the saltpans brines are bicarbonate, chloride, sulphate, sodium, calcium, iron, magnesium and potassium (Taher *et al.*, 1995). This study estimated the physico-chemical parameters from the different brines of Kovalam, Thamaraiikulam and Puthalam solar saltpans in Kanyakumari District, Tamil Nadu. Kanyakumari is the southernmost district of the peninsular India. The region of Kanyakumari is situated between 77° - 05' and 77° - 36' of eastern longitude and 8° - 03' and 8° - 36' of the northern latitude. The region of Kovalam is 8° - 05' and 03- 03 north latitude, 77° - 31' and 19 - 19 east longitude. The region of Thamaraiikulam is situated at 8° - 04'N latitude and 77° - 68' east longitude. The region of Puthalam is 8° - 06' and 03 - 91 north latitude 77° - 28' and 40 - 89 east longitude.

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**MATERIALS AND METHODS**

In Kanyakumari District, currently there are three villages (Kovalam, Thamaraiikulam and Puthalam) producing salt. Kovalam, Thamaraiikulam and Puthalam are situated near the seashore of Kanyakumari District. Kovalam saltworks use the seabrine from Arabian Sea for salt production. The seawater is taken to the saltpan through canal provisions. Thamaraiikulam saltworks use backwater for salt production. The backwaters have a unique ecosystem – freshwater from the rivers meets the seawater and mixed with salt water from the sea by tidal waves and water currents. Puthalam saltworks use sub-soil brackish water for salt production. Brackish water is water that has a higher salt content than fresh water but a lower content than seawater. The sub-soil brine is pumped from underground into a big pond which acts as the reservoir. The water samples for the present study were collected monthly for the period of the year 2013 and 2014 in clean polythene cans and carried immediately to the laboratory. Physico-chemical parameters such as temperature, pH, salinity, dissolved oxygen, total dissolved solids, bicarbonate, chloride, sulphate, sodium, calcium, iron, magnesium and potassium were studied. Water temperature, salinity and pH are monitored on the site and the rest of the

Table 1. Maximum mean value of physico-chemical parameters in Kanyakumari District saltpans

Sampling sites	Stages	Temperature	pH	Salinity	Dissolved oxygen	TDS	Bicarbonate	Chloride	Sulphate	Sodium	Calcium	Iron	Magnesium	Potassium
Kovalam (Sea brine)	1	33.00	7.40	39.17	4.88	9.04	1.37	2.69	0.25	2.74	0.16	3.76	0.25	0.65
	2	34.33	7.44	120.67	4.08	35.27	2.33	4.71	0.26	5.11	0.24	4.26	0.26	1.05
	3	35.83	7.64	210.00	2.93	44.47	3.32	5.81	0.34	5.29	0.24	4.29	0.28	1.06
Thamaraikulam (Backwater brine)	1	30.33	7.30	37.67	5.51	12.20	1.37	2.29	0.24	2.43	0.18	3.23	0.24	0.56
	2	32.00	7.42	121.67	4.24	32.50	1.95	4.09	0.26	4.23	0.25	3.70	0.25	0.94
	3	34.83	7.44	208.33	3.16	41.87	2.71	5.21	0.28	5.19	0.26	4.26	0.26	1.02
Puthalam (Sub-soil brine)	1	29.90	7.40	40.67	4.94	13.17	1.49	2.37	0.19	2.24	0.20	3.04	0.21	0.68
	2	30.00	7.44	141.67	4.10	38.93	1.83	3.74	0.25	3.33	0.19	3.65	0.22	0.96
	3	31.00	7.46	206.67	2.44	40.67	2.63	5.16	0.26	4.39	0.23	4.19	0.24	1.02

Stages: 1. Reservoir 2. Condenser 3. Crystallizer

parameters were analysed in the laboratory by standard methods (APHA, 1998) and they are expressed in ppm/l.

## RESULTS AND DISCUSSION

The physico-chemical parameters were analysed and tabulated in Table 1. The data revealed that there were considerable variations in their physico-chemical characteristics. The high temperature, high salinity, the evaporating water, low oxygen and neutral pH are the characteristic features of the saltpans (Gunde Cimerman *et al.*, 2000), which were also observed in the present study. The brine temperature at different stages of the saltpans ranged between 29.90°C and 35.83°C. Uniform increase in temperature from the reservoir to the crystallizer was also observed. All the saltpans had maximum temperature for various stages from March to May. The pH value increases from reservoir to crystallizer, because of the increasing concentration of iron oxide and calcium carbonate. The high salinity was recorded in the crystallizer pond during March to May. Dissolved oxygen is decrease reservoir to crystallizer pond when salinity increases, the amount of dissolved oxygen decreased. A similar trend was reported by Chidambarathanu (1998). The value of bicarbonate, chloride, sulphate, sodium, calcium, iron, magnesium and potassium were gradually increased from reservoir to crystallizer, this is related with the findings of Femitha *et al.* (2012). The calcium level is lower than the magnesium level (Sundararaj *et al.*, 2006), which was also observed in the present study. The concentration of ions in sea brine (Kovalam saltpan) was maximum, when compared to that of backwater (Thamaraikulam) and sub-soil brine (Puthalam). The yield of sodium chloride was maximum from seabrine (Betsy Bai *et al.* (2012), which was also observed in the present study.

## Conclusion

Physico-chemical parameters were studied in three saltpans namely, Kovalam, Thamaraikulam and Puthalam. Among these three saltpans, maximum percentage of ions were present in Kovalam saltpan because of the seabrine. Calcium content is maximum in Thamaraikulam saltpan and the other ions are in medium quantity because of the back water brine.

In Puthalam solar saltpan sub-soil brine was used as the physico-chemical parameters were minimum compared to other two saltpans.

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