

AN ASSESSMENT OF THE PHYSICO-CHEMICAL PARAMETERS OF PUTHALAM SALTPAN WATER OF KANYAKUMARI DISTRICT, TAMIL NADU, INDIA

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Abstract: An attempt has been made to determine the water quality in Puthalam saltpan during 2010. Water samples were collected and the physico-chemical parameters were analyzed. Throughout the observation period the pH was alkaline. The temperature ranges from 21°C to 28.8°C. High salinity was observed and it attributed to the low amount of rainfall in that season and low salinity was observed in winter. TDS and calcium content was higher in summer and low in autumn. High concentration of sodium and potassium observed in spring. Sulphate attains high value in summer and it was low in spring. Chloride expressed minimum value in winter but maximum in autumn. This study provides baseline information of the physico-chemical parameters for further assessment and monitoring of this type of ecosystems.

Keywords: Physico-chemical parameters, Puthalam, Saltpan.

INTRODUCTION

Solar salt works use energy from wind and sun to evaporate seawater, inland brines, or subterranean saline water in outdoor ponds and manufacture salts (sodium chloride) or other valuable products (Davis, 2009). Saltpan ecosystem is highly dynamic where the organisms are subjected to vulnerable physico-chemical disturbances. In a typical salt work seawater is allowed to flow to the next pond of the series until the water becomes saturated with sodium chloride. This brine is stored in reservoirs. The brine is then pumped into crystallizers ponds where sodium chloride precipitates. In the traditional salt fields, seawater is pumped directly into crystallizers. These widely varying physico-chemical parameters induce great physiological modifications in the organisms to adapt themselves to these extremes (Sundararaj *et al.*, 2006). The knowledge of the physico-chemical quality of saltpan water becomes important, seasonal variation in the physico-chemical characters of water prevailing in this saltpan has not been studied in detail. Therefore it was thought to undertake studies on physico-chemical quality of saltpan water in Puthalam saltpan.

MATERIALS AND METHODS

The present investigations were made at Puthalam saltpan located at Kanyakumari district of Tamil Nadu, India. It uses the subsoil brine and estuarine water for salt production. Water is stored in outer reservoir and it used when needed. The total area of the saltpan is 56.66 ha. and it takes 35 – 40 days to harvest salt. The water samples for the present study were collected at monthly for the period of the year 2010 in clean polythene cans and carried immediately to the laboratory. Hydrographical factors such as pH, temperature, salinity, TDS, sodium, chloride, sulphate, calcium, magnesium and potassium were studied. Water temperature, salinity and pH are monitored on the site and the rest of the parameters were analyzed in the laboratory by standard methods (APHA, 1998) and they are expressed in ppm/l.

RESULTS AND DISCUSSION

The physico-chemical parameters were analyzed and tabulated in Table – 1. The data revealed that there were considerable variations in the quality with respect to their physico-chemical characteristics. Physico-chemical analysis of Puthalam saltpan was studied in different seasons.

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Table 1. Seasonal variations in Physico-chemical parameters of water from Puthalam Saltpan during 2010

Seasons	Stations	pH	Water temperature (°C)	Salinity (‰)	TDS	Sodium	Chloride	Sulphate	Calcium	Magnesium	Potassium
Season I (Summer)	Reservoir	6.38 ± 0.31	26.49 ± 0.42	61.36 ± 5.77	1.74 ± 0.53	0.63 ± 0.10	2.26 ± 0.17	0.08 ± 0.00	0.08 ± 0.01	0.18 ± 0.04	0.13 ± 0.01
	Condenser	7.26 ± 0.38	28.43 ± 1.32	115.8 ± 7.12	5.76 ± 1.46	0.95 ± 0.26	4.47 ± 0.39	0.17 ± 0.02	0.14 ± 0.04	0.42 ± 0.06	0.23 ± 0.02
	Crystallizer	7.60 ± 0.34	28.84 ± 0.13	184.3 ± 10.03	7.98 ± 1.04	2.02 ± 0.49	5.21 ± 0.61	0.26 ± 0.02	0.19 ± 0.04	0.48 ± 0.04	0.31 ± 0.00
Season II (Autumn)	Reservoir	6.65 ± 0.22	24.50 ± 0.56	54.38 ± 5.40	1.62 ± 0.57	0.66 ± 0.07	2.05 ± 0.56	0.06 ± 0.00	0.07 ± 0.01	0.22 ± 0.02	0.09 ± 0.02
	Condenser	7.48 ± 0.22	26.42 ± 1.21	121.10 ± 7.53	4.12 ± 1.25	1.04 ± 0.21	4.35 ± 0.33	0.16 ± 0.02	0.12 ± 0.02	0.39 ± 0.01	0.16 ± 0.03
	Crystallizer	7.70 ± 0.27	27.30 ± 0.89	193.56 ± 9.62	7.07 ± 0.41	1.78 ± 0.14	5.53 ± 0.38	0.25 ± 0.02	0.18 ± 0.01	0.58 ± 0.00	0.24 ± 0.05
Season III (Spring)	Reservoir	6.44 ± 0.31	25.30 ± 1.95	46.05 ± 7.43	1.77 ± 0.51	0.68 ± 0.04	2.09 ± 0.38	0.06 ± 0.00	0.07 ± 0.02	0.20 ± 0.04	0.12 ± 0.01
	Condenser	7.46 ± 0.01	25.20 ± 1.28	110.06 ± 3.60	4.82 ± 2.23	1.89 ± 0.11	4.00 ± 0.45	0.16 ± 0.02	0.11 ± 0.01	0.37 ± 0.01	0.24 ± 0.01
	Crystallizer	8.11 ± 0.42	26.80 ± 2.38	197.16 ± 5.07	7.49 ± 1.37	2.48 ± 0.22	5.18 ± 0.33	0.24 ± 0.01	0.18 ± 0.06	0.45 ± 0.05	0.33 ± 0.00
Season IV (Winter)	Reservoir	6.40 ± 0.25	21.09 ± 1.69	38.0 ± 0.48	1.86 ± 0.49	0.56 ± 0.66	1.61 ± 0.03	0.13 ± 0.00	0.08 ± 0.03	0.17 ± 0.01	0.06 ± 0.01
	Condenser	7.36 ± 0.47	25.24 ± 2.29	116.39 ± 9.31	5.97 ± 1.57	1.26 ± 0.51	4.23 ± 0.25	0.13 ± 0.00	0.14 ± 0.01	0.35 ± 0.06	0.13 ± 0.03
	Crystallizer	8.01 ± 0.58	26.94 ± 2.88	192.08 ± 5.95	7.72 ± 0.97	2.09 ± 0.48	4.60 ± 0.15	0.25 ± 0.01	0.18 ± 0.04	0.50 ± 0.06	0.22 ± 0.03

There was no significant change in the pH value during the observation period, the observed values where in the range of 6.38 to 8.11. This indicating that the area is alkaline. Similar results were made by Abowei (2010), Muduli and Panda (2010) and Reginald and Laila Banu (2009).

The temperature range from 21°C to 28.8°C. Minimum temperature was recorded during winter season. The surface water temperature showed an increasing trend in summer was influenced by the intensity of solar radiation and evaporation rate. A similar trend was reported by Ashok Prabu *et al.*, (2008), Rajkumar *et al.*, (2009) and Sankar *et al.*, (2010).

Solar salt works consist of three distinct biological areas (Reservoir, Condenser and Crystallizer), which can be conveniently considered as a junction of salinity (Reginald and Laila Banu, 2009). The high salinity was recorded during season III could be attributed to the low amount of rainfall and higher rate of evaporation of the surface water. Low salinity values were recorded in winter in the present study. During winter the rainfall could cause dilution of salt pit water and hence cause reduction in salinity (Sankar *et al.*, 2010)

TDS value is higher in summer than the other seasons, which are within the permissible limits. The same kind of result observed by Muduli and Panda (2010) in Dhamra estuary. The lower value was observed in autumn season.

Calcium is an important element influencing flora of ecosystem, which plays important role in metabolism and growth. The highest calcium value was found in Summer due to evaporation of water while least content was recorded in Autumn and Spring respectively. The calcium content was always found lesser than magnesium (Sundararaj *et al.*, 2006). Calcium and sulphate attained their maximum values during summer (Hussein *et al.*, 2010) as per they attained and their minimum values during spring. Magnesium showed their minimum concentrations during summer and this is in agreement with the findings of Hussein *et al.*, (2010).

Higher concentration of sodium was observed in spring season compared to other seasons. Sodium was found to increase with pH and salinity. The chloride content was high in autumn season and low

in winter. Sodium and chloride are the major components of salt.

Potassium concentration was observed high in spring and lower in winter. Higher concentration of potassium is likely due to silicate minerals, evaporate deposits gypsum and sulphate release considerable amount of potassium into ground water reported by Ramkumar *et al.*, (2010). Variation in the concentration of Na, K, Ca and Mg seems to be only through evaporative loss of water from the systems (Rastogi, 2009).

This present baseline information of the physico-chemical parameters provide a useful tool for further ecological assessment and monitoring of this type of ecosystems.

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