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Seasonal Variations in the Chemical Parameters of Salt in Various Salt-pans of Kanyakumari District

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The seasonal variations in the chemical parameters of the salt samples collected from various salt-pans of Kanyakumari district were studied. Parameters like the percentage of moisture, insoluble impurities, calcium sulphate, magnesium sulphate, magnesium chloride and sodium chloride were analyzed. Variations in the different samples were observed and it was due to the atmospheric climate and strong dusty winds.

Key Words: Chemical parameters, Salt-pans.

INTRODUCTION

Salt, naturally called common salt, had a vital role even during the prehistoric times. The two elements of common salt, *viz.*, sodium and chlorine have important functions in the metabolism of the body. Lack of these leads to death and decay. This cheap and easily available item is the basic material in today's industry. It has more than 14,000 ways of application either directly or indirectly[1].

It becomes part of the human body even in the embryo stage, since the foetus floats in a saline solution. The amount of salt in the human body of an adult is 230 g. The function of sodium is to control the muscular movement and that of chloride ion is to produce hydrochloric acid required for digestion.

Salt is mainly lost through sweating. In cases of frequent loose motions, there is depletion of salt. These losses can be rectified by the intake of salt with food. As rice is deficient in salt, rice eating people require more salt. In temperate climate, the annual human requirement of salt is about 5 kg/year.

Inadequacy of salt produces loss of weight, nausea, an muscular cramps. Excessive heat, like the summer in deserts, results in salt depletion and causes heat strokes in the case of children.

On the other hand, excess of sodium in salt can contribute to hypertension, heart, liver and kidney diseases. Insufficient salt stunts the growth of young animals. Salt has been used for flavouring, pickling, preserving, curing fish and meat and also in tanning[2].

Today, only 6% the world's annual salt production is directly used for human consumption, the rest being consumed mainly by chemical industries[3].

As the frontiers of the chemical industry grow, new applications for salt and

its derivatives are constantly being discovered. In future, salt will be having a greater role to play in various fields.

This work involves a thorough study of various parameters of the salt samples collected from various salt pans of Kanyakumari district during a period of one year.

EXPERIMENTAL

The first sample was collected from Palkulam which is nearly 5 km from Kanyakumari towards Tirunelveli. The second sample was collected from the salt-pans located in Kovalam, which is 20 km away from Nagercoil, and 2 km west of Kanyakumari. The third sample was collected from Swamy Thope, located in Thamaraikulam village, which is about 12 km south-east of Nagercoil. The fourth sample was taken from Puthalam, nearer to Manakudi village and about 8 km south-west of Nagrcoil. The fifth sample was collected from the Rajackamangalam salt pan, which is located 10 km away from Nagercoil in the west.

Samples were collected monthly from January to December from the above five salt-pans. Parameters like the percentage of moisture, insoluble impurities, calcium sulphate, magnesium sulphate, magnesium chloride and sodium chloride were analyzed. The percentage of rnoisture was determined by weighing exactly 20 g of the salt and heated to 110–140°C and weighed. The difference in weight gave the moisture content. The percentages of insoluble impurities were determined by dissolving 5 g of the salt in a minimum amount of water. Then filtered it through a previously weighed filter paper. After the filtration was over, the filter paper was kept in an oven for 3 h and weighed with the insoluble impurities. The difference in the weights gave the amount of insoluble impurities. The percentages of chloride, sulphate, calcium and magnesium ions were also determined by standard methods[4]. By knowing the percentage of chloride, sulphate, calcium and magnesium ions, the percentages of calcium sulphate, magnesium sulphate, magnesium chloride and sodium chloride were calculate using standard procedures[5].

RESULTS AND DISCUSSION

The moist content in the samples from the various salt-pans was not the same throughout the year (Table-1). Seasonal variations were observed. This indicated that the atmospheric climate influenced the moisture content in the salt samples.

Regarding the percentage of insoluble impurities of the various samples, again the seasonal changes played a vital role. The higher percentage of insoluble impurities was due to the strong dusty winds (Table-2).

Considering the percentage of calcium sulphate, magnesiurn sulphate and magnesium chloride in the various samples, the values fluctuated due to the variation in the concentration of the above salts in the original brine, which was used for the solar salt manufacture. The percentages of all the above salts in the samples were found to have marginal differences. It was observed that all the brines do not have the same concentration of the various salts (Tables 3–5).

Regarding the percentage of sodium chloride, as we expected, the sample from sea water, *i.e.*, Kovalam relatively had higher concentration than the other samples. This indicated that sea brine was more saline than the underground brine. Here also, the seasonal variations were observed in the percentage of sodium chloride (Table-6).

TABLE-1
MOISTURE CONTENT (%) IN VARIOUS SALT SAMPLES

Month	A	B	C	D	E
Jan.	1.72	1.48	1.51	1.56	1.83
Feb.	1.46	1.91	1.61	1.72	1.73
Mar.	1.83	1.51	1.67	1.43	1.56
Apr.	1.49	1.49	1.72	1.63	×
May	1.78	1.48	×	1.66	×
June	1.83	1.46	1.94	1.55	×
July	2.11	2.01	1.94	1.90	×
Aug.	2.00	2.00	2.34	2.17	1.93
Sep.	2.64	2.91	×	×	×
Oct.	×	×	×	×	×
Nov.	×	×	×	×	×
Dec.	×	×	×	×	×

TABLE-2
INSOULBLE IMPURITIES (%) IN VARIOUS SALT SAMPLES

Month	A	B	C	D	E
Jan.	1.44	1.34	1.93	1.14	1.39
Feb.	1.10	1.18	1.48	1.74	1.64
Mar.	1.42	1.97	1.08	1.16	1.78
Apr.	1.76	1.04	1.33	1.18	×
May	1.42	1.25	×	1.57	×
June	1.24	1.54	1.84	1.40	×
July	1.33	1.84	1.42	1.57	×
Aug.	1.92	1.16	1.77	1.37	1.64
Sep.	1.65	1.23	×	×	×
Oct.	×	×	×	×	×
Nov.	×	×	×	×	×
Dec.	×	×	×	×	×

A—Kovalam, B—Palkulam, C—Swamythope, D—Puthalam, E—Rajackamangalam
×—Samples not available due to rainfall.

Table-3
CALCIUM SULPHATE (%) IN VARIOUS SALT SAMPLES

Month	A	B	C	D	E
Jan.	1.07	0.99	1.16	1.02	1.13
Feb.	1.02	1.07	1.16	1.13	1.64
Mar.	1.09	1.03	1.12	1.21	1.78
Apr.	1.09	1.12	1.04	1.21	×
May	1.17	1.08	×	1.05	×
June	1.03	1.14	1.17	1.08	×
July	1.08	1.19	1.14	1.05	×
Aug.	1.16	1.20	1.08	1.14	1.03
Sep.	1.05	1.11	×	×	×
Oct.	×	×	×	×	×
Nov.	×	×	×	×	×
Dec.	×	×	×	×	×

TABLE-4
MAGNESIUM SULPHATE (%) IN VARIOUS SALT SAMPLES

Month	A	B	C	D	E
Jan.	1.25	1.18	1.27	1.11	1.16
Feb.	1.30	1.16	1.02	1.08	0.97
Mar.	1.09	1.56	1.07	0.95	0.55
Apr.	1.17	0.68	1.55	0.92	×
May	0.93	1.21	×	1.24	×
June	1.16	0.96	1.02	1.44	×
July	1.22	1.46	0.98	1.22	×
Aug.	1.12	1.00	1.06	1.19	1.57
Sep.	1.12	1.24	×	×	×
Oct.	×	×	×	×	×
Nov.	×	×	×	×	×
Dec.	×	×	×	×	×

A—Kovalam, B—Palkulam, C—Swamythope, D—Puthalam, E—Rajackamangalam
×—Samples not available due to rainfall.

TABLE-5
MAGNESIUM CHLORIDE (%) IN VARIOUS SALT SAMPLES

Month	A	B	C	D	E
Jan.	0.75	0.98	0.99	0.94	0.99
Feb.	0.69	0.70	1.00	1.11	0.94
Mar.	1.03	0.51	1.08	1.08	1.52
Apr.	1.16	1.35	0.79	1.22	×
May	1.13	0.83	×	0.95	×
June	0.92	1.09	1.12	0.69	×
July	0.85	0.76	0.96	0.89	×
Aug.	1.04	1.17	1.04	1.04	0.50
Sep.	0.89	0.97	×	×	×
Oct.	×	×	×	×	×
Nov.	×	×	×	×	×
Dec.	×	×	×	×	×

TABLE-6
SODIUM CHLORIDE (%) IN VARIOUS SALT SAMPLES

Month	A	B	C	D	E
Jan.	94.33	88.43	90.08	92.40	88.96
Feb.	94.42	90.46	90.66	92.78	90.73
Mar.	94.45	92.20	90.99	93.25	89.87
Apr.	94.84	90.10	91.34	91.94	×
May	92.18	89.85	×	91.32	×
June	92.44	89.52	88.94	91.63	×
July	91.98	89.94	89.15	90.85	×
Aug.	92.83	89.44	89.05	91.75	89.23
Sep.	92.47	89.14	×	×	×
Oct.	×	×	×	×	×
Nov.	×	×	×	×	×
Dec.	×	×	×	×	×

A—Kovalam, B—Palkulam, C—Swamythope, D—Puthalam, E—Rajackamangalam
×—Samples not available due to rainfall.

Conclusion

The salt sample from the sea brine had higher percentage of sodium chloride. The percentages of all the above salts in the samples were found to have marginal differences. It was observed that all the brine samples were having different concentrations of the various salts.

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