

# Physico-Chemical Analysis of Marine Soils From Different Ecosystem Palk Strait Coastal Regions of Tamilnadu, India

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## Abstract

Many researchers focus on the marine coastal zones. Present study was physical and chemical characteristics of soil in three different marine ecosystem of six different places sea shore (Point Calimere [Kodiyakarai], Adirampattinam, Mallipattinam and Manora), saltpan (Vedaranyam), mangroves Forest (Muthupet) Palk Strait coastal regions of Tamilnadu, India, was performed. The marine soil were selected for the following boundaries like Soil texture, Calcium Carbonate, Electrical conductivity, Power of hydrogen, Macronutrients like (Organic carbon, Nitrogen, Phosphorus, Potassium), Micronutrients like (Iron, Manganese, Zinc, Copper) and others Cation exchange capacity, Magnesium, Sodium were studied. At the end of the soil collected from various stations showed differences in all analyzed features.

**Keywords:** Mangrove; Sediment soils; Physico-chemical analysis; Palk Strait regions

## Introduction

Soil is one of the major and costly properties of the nature. Every living is straight and lastly dependent on soil for the human food is derivative from the earth. Creation plan for have strong and soil is essential to human being survival. Soil has composite role which is useful to human and other living organism. Marine environmental conditions such as temperature, pH, salinity, nutrients, sediments and soil texture find out composing the biota [1]. Increased temperature [2], low salinity [3], sediment nutrients and availability of organic matter Nair et al. [4] have been found to favor the growth and distribution of microorganisms. Microbes like fungus, bacteria and other atomic life form available surrounded by the soil are also important and therefore soil is an active medium made up of mineral deposits, macrobiotic matter, aquatic, atmosphere and microorganisms. The natural history of soil first and advanced depend on its nonstop change under the cause of physical reasons like the close relative substance, instance, the weather, the organic in it etc. [5].

The physical-chemical features like power of hydrogen, electrical conductivity, moisture content, organic matter, nitrogen, and potassium were studied, tabulated with in brief discussed Das and Bindi [6]. The physical-chemical study of soil samples under revision show erratic concentration of different features. Potent distributions of micronutrients were recorded in the present investigation which may be recognized to the added fertilizers during the crop formation [7-8].

Human being behavior with metal mining, smelting and dying, coal fire, refuse burning, fossil fuel burning and agricultural practices have at large numerous to excess of trace elements into the environment [9]. With them Think, during many research for the study idea and the main goal for many years, in the waters naturally large high salinity, climate change and the sea caused a volcanic eruption, earthquake, natural disasters die in the soil decayed the marine life, plants, animals and micro-organisms. Therefore, the present study aims to record the Physical-chemical features marine soil from different marine ecosystem like seashore, hypersaline salt pan and mangrove environments of Palk Strait region of Tamil Nadu, India.

## Materials and Method

### Collection and processing of marine soil Sample

Soil sample were collected from six different locations of three different ecosystems like sea shore [Point Calimere (Kodiyakarai)], Adirampattinam, Mallipattinam and Manora, saltpan (Vedaranyam), mangrove (Muthupet) marine environmental soils of Palk Strait coastal regions of Tamil Nadu, India (Figure 1). Surface contaminated soils were removed using a spade to a depth of 2 cm [10]. Using V-shaped holes in the soil to a depth of 20 cm thick piece of sample collection is taken in a plastic bucket digging collected. The soil was collected after the registered name of the place. Merrily soil collected in the dryer and the wind blew them into cubes and store in clean plastic bags secured was studied in laboratory conditions (Figure 1) [11].

### Inspection of marine soil texture, CaCO<sub>3</sub>, EC, CEC, pH, macro and micro nutrients

Comparative amount of different range soil is an important physical limit to find out soil texture. The percentage of the soil particles were determined by 10 g air dried soil sample was mixed with 20 mL distilled water. The mix was heated for 3 min to break the large sized soil. 5 mL hydrogen peroxide was added to the mix. The solution was filtered through common filter paper. The soil balance of filter paper was then treating with 125 mL of 3 Normality HCl and left it for immediately. The solution was filtered again and soil filtrate dried in air. The dried soil was passed through 0.2 mm pore sized technical filter. The filter soil was transferred into a flask and sufficient amount of 1 Normality

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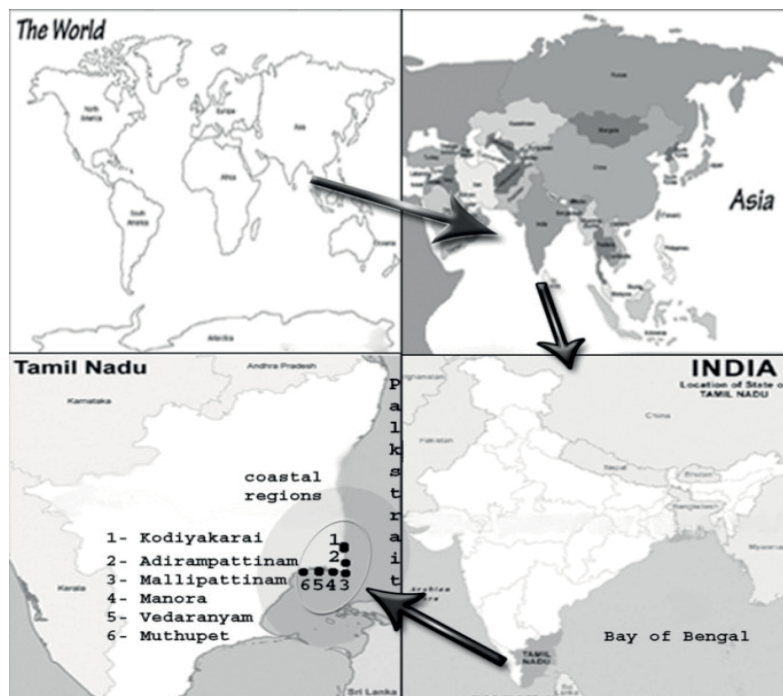


Figure 1: Sea coastal area of soil collected by the Palk Strait in southern India's Tamil Nadu Map.

sodium hydroxide was added to make the inside alkaline. After shaking the container for 6 h on the mechanical shaker, the content was move to 500 mL measuring jar and the volume was made up to 250 mL by distilled water. It was stopper and was allowed to settle after shaking. The supernatant was free into a separate beaker and soil was washed again and again till the delay was clear. This was transferred to another tarred dish, heated and weighted, which was the reading of fine sand [12-15].

Calcium carbonate was extracted with neutral 1 N ammonium acetate and the available calcium carbonate in the extract was determined by Smith and Doran [15]. Electrical conductivity (EC) of the soluble salts in the soil contents of the ion current fixing reveals. If any one of the electrical conductivity of the soil samples are included in 20 g soil suspension 40 mL distilled water and stirred for 30 min after the soluble salts had been fully used by an Equiptronics digital electrical conductivity was detected and recorded. Cation exchange capacity (CEC) of the soil was determined by using 1 Normality ammonium acetate solution as give details by Jackson [13].

Power of hydrogen values were determined by pH meter. 10 g soil samples were mixed with 20 mL distilled water in. The suspension was stirred continuously with glass rod for 15 min and left for 1 h. The electrode was added into supernatant and pH was recorded. Power of hydrogen value as calculates of the hydrogen ion action of the soil water and state the acidity and alkalinity of the soil. It is an important property of soil as it fixes the accessibility of nutrients and physical condition of soil [14-15].

The Macronutrients like Organic carbon, Nitrogen, Phosphorus, Potassium was determined by Jackson [16-17]. The Micronutrients like Iron, Manganese, Zinc, Copper and others Magnesium, Sodium were studied [18-20].

## Result and Discussion

The marine soil is measured like the mainly significant issue in the

marine atmosphere that influences the growth, replica and metabolic actions of biotic components including microbes. In the current study, the physico-chemical factor including Soil texture, Calcium Carbonate, Electrical conductivity, Power of hydrogen, Macronutrients like (Organic carbon, Nitrogen, Phosphorus, Potassium), Micronutrients like (Iron, Manganese, Zinc, Copper) and others Caution exchange capacity, Magnesium and Sodium of the Palk Strait coastal soil samples were study (Table 1).

The soil textures are shown in Table 1. The results showed that various marine environmental soils change from Sands, Sands and Clay, Sandy Loams, and Clay Loams in soil value were reported (Figures 2a-2f).

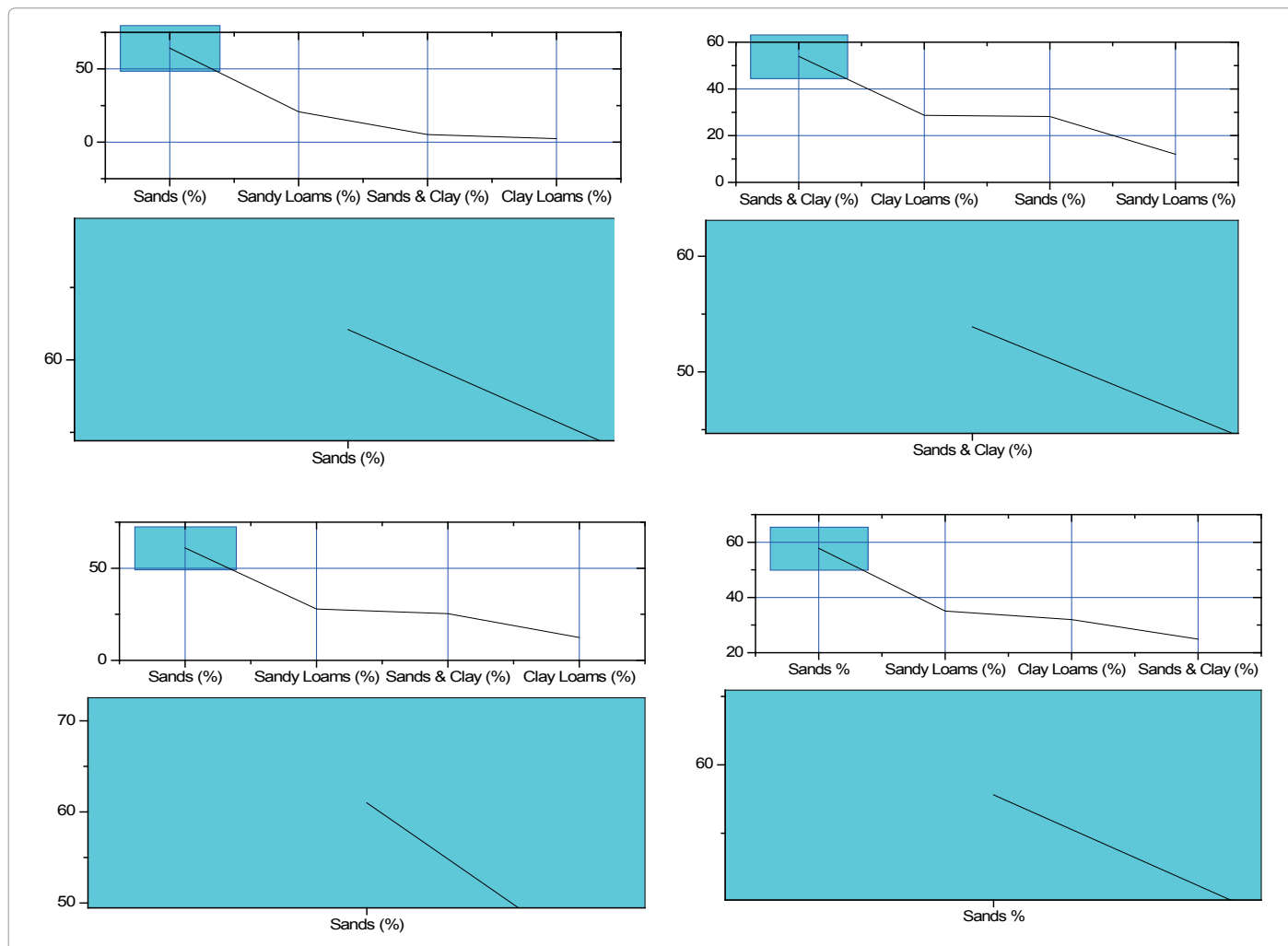
The physicochemical characterization of seven marine sediment samples was investigated and collected from different zones with Thondi coastal sediments along the southeast coast of India. The study found that variation in physical parameters and mud contents were due to differences in sediment source. Results of Station 3 revealed the calculated average values as follows: Bulk density (BD) (1.3 g/cm<sup>3</sup>), particle size distribution of-sand (50.5%), silt (31.5%), and clay (18%). Further, the water holding capacity (WHC) was observed to be 65.3% [21]. The soil parameters like texture, calcium carbonate content, electrical conductivity (EC), pH, organic carbon (OC), available nitrogen, available phosphorus, available potassium iron, manganese, zinc, copper and cation exchange capacity were studied by the standard methods. Further, the correlation coefficient analysis between the physical and chemical boundaries of the marine soil samples and total actinobacterial isolates were performed [22].

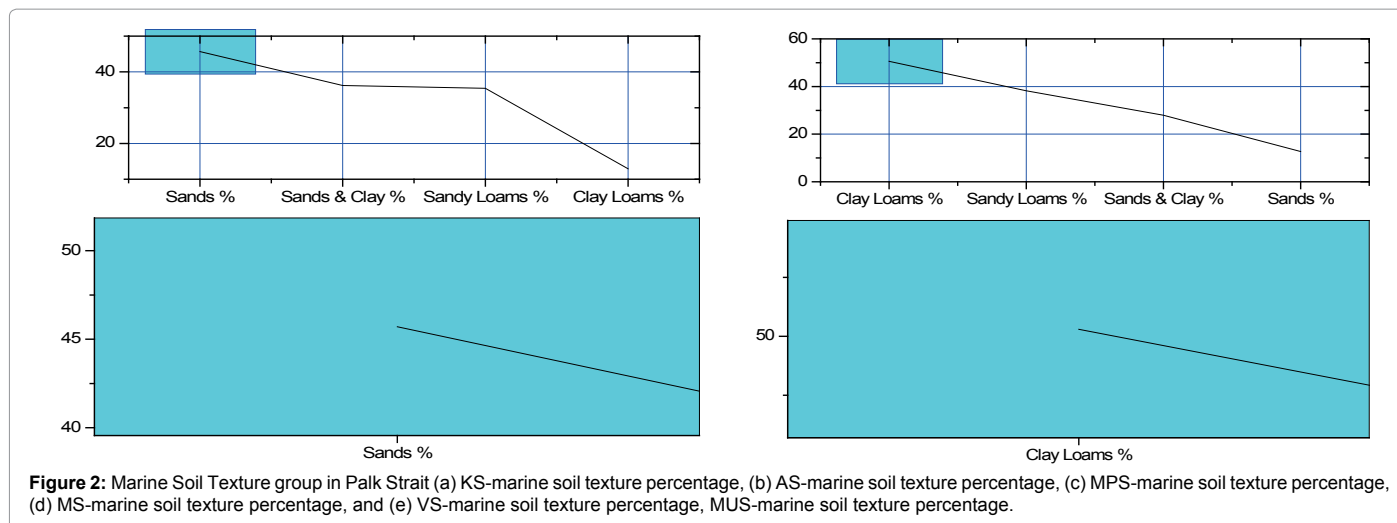
The minimum Calcium Carbonate (5.56 mg/kg), Magnesium (3.15 mg/kg) and Sodium (2.21 mg/kg) was present in Adirampattinam, Mallipattinam soil samples were recorded, the maximum Calcium Carbonate (8.25 mg/kg), Magnesium (9.10 mg/kg) and Sodium (3.17 mg/kg) was present in Vedaranyam, Muthupet soil respectively (Figure 3a).

Name of the Parameters	Soil samples from different ecosystems (Session: July 2015)					
	sea shore				saltpan	mangrove
	KS	AS	MPS	MS	VS	MUS
<b>Soil texture (%)</b>						
Sands	64.2	28.2	61.0	57.8	45.7	12.7
Sands & Clay	05.1	53.9	25.4	24.9	36.2	27.9
Sandy Loams	20.7	12.0	27.9	35.1	35.4	38.2
Clay Loams	02.3	28.7	12.4	32.0	12.9	50.6
CaCO <sub>3</sub> (mg/kg)	7.44	5.56	7.73	7.33	8.25	7.94
EC (dsm-1)	2.10	11.0	2.57	6.12	12.3	16.2
pH	5.25	8.23	6.62	5.35	7.12	6.13
Organic carbon (%)	0.22	1.25	1.01	0.57	0.20	2.30
Nitrogen (kg/ha)	25.1	59.2	32.2	57.3	33.2	98.4
Phosphorus (kg/ha)	7.12	3.45	5.81	5.01	3.23	7.51
Potassium (kg/ha)	150	392	52	277	387	887
Iron (ppm)	4.3	11.0	7.01	11.2	7.47	7.64
Manganese(ppm)	4.71	15.2	4.31	1.57	9.52	11.3
Zinc (ppm)	1.30	0.21	0.14	0.17	0.12	1.21
Copper (ppm)	2.23	1.21	1.05	1.24	2.52	1.42
CEC (C.mole proton/kg)	24.4	19.2	17.3	13.2	53.4	14.8
Magnesium (mg/kg)	6.71	5.12	3.15	4.22	5.86	9.10
Sodium (mg/kg)	2.36	2.42	2.21	2.52	3.17	2.70

KS: Kodyyakarai Soil; AS: Adirampattinam Soil; MPS: Mallipattinam Soil; MS: Manora Soil; VS: Vedaranyam Soil; MUS: Muthupet Soil; CaCO<sub>3</sub>: Calcium Carbonate; EC: Electrical Conductivity; pH: Power of Hydrogen; CEC: Caution Exchange Capacity

**Table 1:** Detect of various physico-chemical parameters in marine soil samples from Palk Strait.





The minimum Cation exchange capacity (13.2 C. mole proton/kg), Electrical conductivity (2.10 dsm-1) and pH (5.25) Manora, Kodyakarai soil samples were studied, the soil maximum Cation exchange capacity (53.4 C. mole proton/kg), electrical conductivity (16.2 dsm-1) and pH (8.23), Vedaranyam, Muthupet mangrove and Adirampattinam soils at the produce, respectively (Figure 3b).

The macronutrients like Organic carbon (41%), Nitrogen (98.4 kg/ha), Phosphorus (7.51 kg/ha) and Potassium (887 kg/ha), the present study were recorded maximum at Muthupet mangrove soil. The minimum contents of the macronutrients organic carbon (3.6%), Nitrogen (25.1 kg/ha), Phosphorus (3.23 kg/ha) and Potassium (52 kg/ha) recorded at soil samples collected from Vedaranyam, Point Calimere, Mallipattinam respectively (Figures 3c-3d).

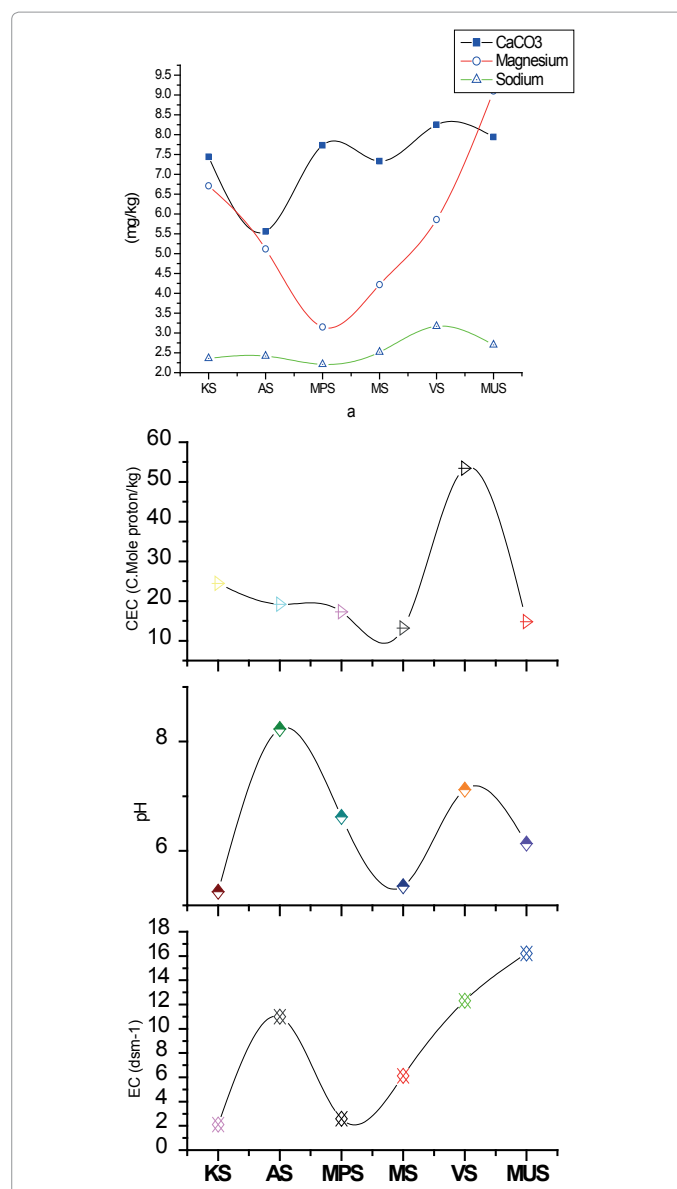
The micronutrients like Iron (11.2 ppm), Manganese (15.2 ppm), Zinc (1.30 ppm) and Copper (2.52 ppm) the present investigated were recorded maximum at Manora, Adirampattinam, Kodyakarai, Vedaranyam soil. The minimum contents of Iron (4.3 ppm), Manganese (15.2 ppm), Zinc (1.30 ppm) and Copper (2.52 ppm) were documented at Kodyakarai, Manora, Mallipattinam soil (Figure 3e). Sea, soil, characteristics, properties, pH-acidic natures have been reported previously [23].

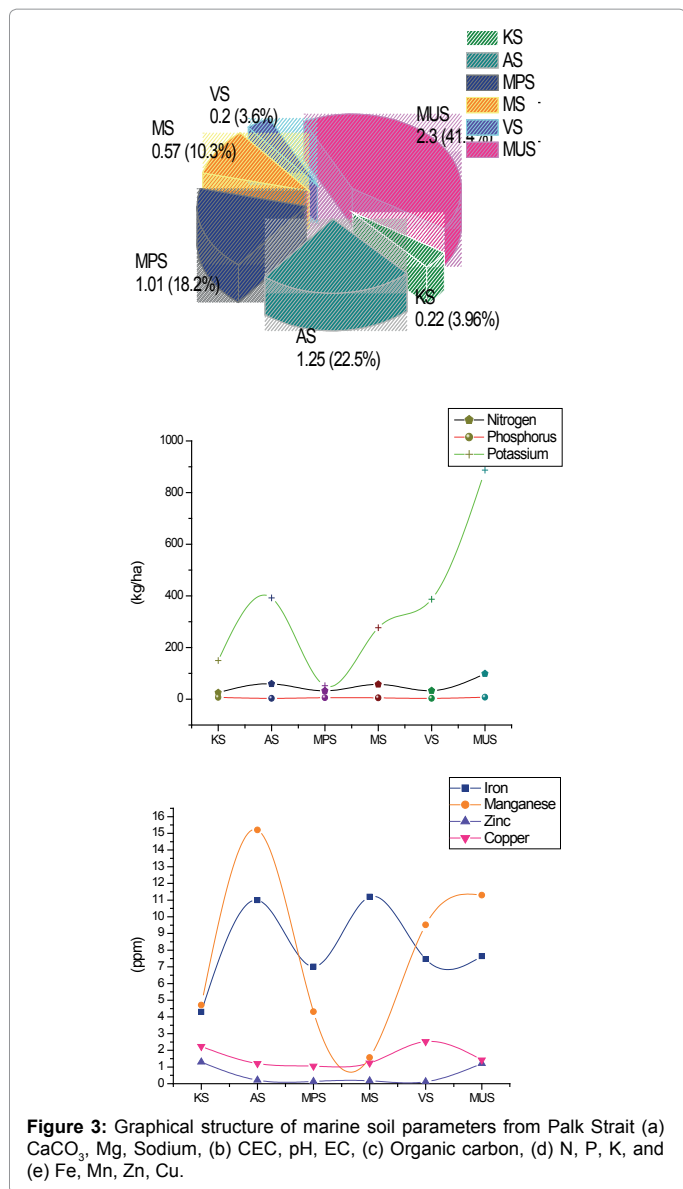
Soil characteristics such as pH 7.22-7.69, electrical conductivity 0.41 dSm-1 to 0.54 dSm-1, cation exchange capacity 16.3-23.8 C. mole proton+/kg, organic carbon 0.36-0.60%, nitrogen 2.74-3.29 mg/kg, phosphorus 1.1-1.28 mg/kg, potassium 4.13-5.34 mg/kg, zinc 0.53-0.89 ppm, copper 0.53-1.97 ppm, iron 2.46-8.54 ppm, manganese 3.10-3.69 ppm, calcium 10.5-12.8 C. mole Proton+/kg, magnesium 6.7-9.2 C. mole Proton+/kg, sodium 1.33-2.98 C. mole Proton+/kg and potassium 0.14-0.28 C. mole Proton+/kg, showed variation during different seasons [18].

It is clear that the threat of ocean acidification on marine ecosystems and species represents a priority for future investigations and large-scale investments in green-energy sources. The most important challenge of research is to identify the vulnerability of some physiological processes of key marine species but also rate of tolerance and adaptation capability to the global climate change [23-26].

## Conclusion

The physico-chemical analysis of soil samples under evaluation showed variable concentrations of various boundaries. Irregular





**Figure 3:** Graphical structure of marine soil parameters from Palk Strait (a) CaCO<sub>3</sub>, Mg, Sodium, (b) CEC, pH, EC, (c) Organic carbon, (d) N, P, K, and (e) Fe, Mn, Zn, Cu.

distributions of macronutrients and micronutrients were recorded during the present investigation which may be recognized to the further fertilizers for the period of the produce development. The survey of Marine soil ecosystems (sea shore, saltpan, and mangrove) displays of micronutrients in the soils occasionally an able to assess the qualitative and quantitative of the metal concentrations. From here the marine soil strength is recommended as a way of data quality. It is data to take up technique, sample testing, just before gain peak in series appearance from a coast-effective resulting outside program.

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