ASSESSMENT OF ANALYTES FROM THE SOIL OF SAMBHAR LAKE AND ADJOINING AREAS DURING WINTERS

Abstract

The main purpose of the research is to provide an insight into the factors affecting the attributes of the lake. The objective of this investigation was to assess the changes in the soil samples collected from various sites in Sambhar (site1: Sambhar Lake, site2: Jhapok, site3: Fulera) considering different Physico-chemical analytes that might affect the diversity in this lake. This will help in assessing ecosystem management and restoration. Analysis of data revealed that soil cover having various features has a brunt on the earthly inconsistency regarding moisture and other variables. Thus, the result of the present study will assist to comprehend the variation of physical properties for better planning to plan ecological management.

Keywords: Environment, Eco System, Gambits, Migratory Birds, Organic Carbon, Wetlands

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I. INTRODUCTION

The Sambhar Salt Lake is a saline wetland in Rajasthan welcoming a large number of flamingos along with a good number of Pelicans every year as a part of the seasonal cycle. Persistent reduction of Sambhar Lake in Rajasthan with the deterioration of soil and water quality forced a rapid restitution move for conservation of wetland.

Soil is a precious reserve that sustains the life of plants and water is a necessary factor in this system. Soil structure is influenced by climate change. Important physical characteristics like porosity, water holding capacity and bulk density are influenced by humidity. The progress of salt lakes is associated with the climatic variation. Dry and cool climate points toward lowered climatic conditions. Mud and sand are affected by seasonal winds. There is dark and organically rich mud layer is found by underlining the saline layer. The mud sediment encloses salt minerals and the content varies in the different lakes. When evaporation increases, lake water concentrates (Shukal and Rahaman, 2006). It is important to comprehend the physical properties of soil along with their relationship to moisture for superior soil management. Water infiltration, permeability and water-holding capacity are largely affected by soil texture and structure. The arrangement of soil particles into stable units gives soil its structure. Water-holding capacity is regulated mainly by soil texture and organic matter. Generally, soils with smaller particles tend to have a larger surface area as compared to those with larger sand particles. A sizeable surface area permits the soil to hold more water. A soil with a greater percentage of silt and clay particles has a higher water-holding capacity. Sudha Summerwar et al., 2013 investigated the microbiological quality of water in the Bisalpur reservoir made on river Banas near village Bisalpur in Deoli District Tonk.

Conservation of the characteristics can enhance the quality of soil water and air. Since soil is a pool of nutrients, it becomes essential to monitor it from time to time for the sake of maintaining the health of humans and animals.

A large number of migratory birds died in the year 2019 which triggered a descent in the number of migratory birds during the year 2020 at Sambhar Lake. Since the migratory prototype of birds was influenced by the death of a large number of birds in 2019, it became essential to investigate the health of lake soil to protect biodiversity. The present work is aimed at the assess analytes of soil samples of sambhar lake collected from different sites to evaluate alterations in the characteristics of soil after the 2019 tragedy. For superior land management, assessment of the physical behavior of soil to recognize changes in the soil is very imperative and of major concern (Campos *et al.*, 2007).

The research would provide an insight into the factors affecting the attributes of the lake. The objective of this investigation was to assess the changes in the soil samples collected from various sites of Sambhar Lake considering different Physico-chemical analytes that might affect the diversity in this lake. This will help in assessing ecosystem management and restoration.

II. MATERIALS AND METHODS

1. **Study area:** The study area incorporated Sambhar Salt Lake, Rajasthan, India. This saline lake is lying at a latitude and longitude of 26°55'12"N and 75°12'00"E respectively. It is situated off National Highway 8 about 64 km northeast of Ajmer and 96 km southwest of Jaipur, extending up to Nagaur district in Rajasthan. The lake is elliptical running about 22 km in length and is surrounded by Aravalli Mountain ranges. It occupies an area of approximately 230 km2 with a width varying from 3 to 11 km. The average depth of water in the lake is 1 m in the dry season and the maximum depth is 3 m which is achieved during the monsoon season. The Sambhar Lake is of geological importance because of its different physical and chemical characteristics. Sambhar is designated as a Ramsar site (wetland of international importance) as it is a key wintering area for thousands of flamingos and other migratory birds from northern Asia.

2. **Collection of samples:** The soil samples were collected in sterilized bags in triplicate from three sites. The site I included Sambhar Lake; site II included the Jhapok dam and site III incorporated a water body from Phulera, Jaipur. The samples were brought to the laboratory in an ice box and analyzed immediately.

3. **Physical and chemical analyses:** The standard methods were used to measure pH, bulk density, conductivity, particle density, porosity and water holding capacity.

4. **Statistical analysis:** The data obtained from the different sites were analyzed in duplicate and appraised as mean values± standard error. Since site III was away from the proper Sambhar Lake area, soil samples collected from site III were considered control samples.

III. RESULTS AND DISCUSSION

Mean values of all the analytes along with standard error are presented in table1, 2 and 3, respectively for the soil samples collected from the site I, II and III. Mean changes are depicted in figures 1 (pH), 2 (bulk density, conductivity and particle density) and 3 (porosity and water holding capacity).

1. **pH:** This parameter is very important to assess the type of soil based on alkalinity or acidity. It is also an indicator of plant growth and the availability of nutrients to plants. The pH of wetlands varies according to the type of waste. The pH of site I and site II were lower than the pH of soil samples from site III. pH varies according to ion composition.

2. **Conductivity:** Conductivity is a measure of the soluble salt content of the soil. It gives an idea about the total concentration of ionized constituents. It is affected by many environmental factors like interference by humans, climate, geology and biota. It varies according to the condition and location of the soil. Soil conductivity is considered to be an indirect measurement that associates with many physical and chemical characteristics. A material can conduct an electrical current. The mean value was maximum from the samples collected from site III. Soil electrical conductivity is associated powerfully with particle size and soil texture. It has been observed that soils which are affected frequently by drought or disproportionate water will reveal changes in soil texture which can be

demarcated by employing soil conductivity. Water-holding capacity is closely associated with crop yields. There is a vast prospective to employ soil conductivity parameters to differentiate areas with varying yield potential. Soil conductivity also demarcates variations in organic matter content and cation exchange capacity. New approaches in ecological management involve making zones using conductivity parameters for using an efficient gambit. Areas are classified by using a like conductivity values.

3. **Bulk density:** Bulk density was found lowest from the samples of site I whereas, it was maximum from the samples collected from site II. An increase in bulk density is seen as pore space declines. A reciprocal relationship exists between bulk density and porosity. Bulk density is an indicator of soil health. It is appraised to typify the state of soil solidity in answer to the use of land and use of soil management practices. Bulk density is a parameter to assess soil compaction and is computed as the dry weight of soil divided by its volume. This volume includes the volume of soil particles and the volume of pores among soil particles. It imitates the weight of a specific volume of soil and describes the infiltration, available water capacity, soil porosity, soil microorganism activity and availability of nutrients. Higher bulk density entails a decline of macropores. An increase in decomposition leads to higher bulk density due to the loss of organic carbon.

4. **Particle density:** The particle density of a soil gauges the mass of a soil sample in a given volume of particles. Soil samples from the site I and site II revealed higher values as compared to samples from site III. Particle density concentrates on the soil particles. The density of soil particles is a consequence of the chemical composition and structure of the minerals in the soil. Values are employed to comprehend the physical and chemical characteristics of the soil. Along with bulk density data, values are used to compute the porosity in a soil sample. The particle density describes the properties of soil with the conception of the function of soil within the ecosystem of an area.

5. **Porosity:** Soil porosity refers to the fraction of the total soil volume that is being taken up by the pore space. Pore spaces tend to make possible the accessibility and movement of air or water within the environment of soil. Soil biodiversity is influenced by the pores which provide spaces. Porosity largely depends on both soil texture and structure. A fine soil has a smaller but a greater number of pores than coarse soil. A coarse soil has larger particles than fine soil but it has less porosity or overall pore space. It can be deduced that water can be held tighter in small pores than in large pores. Therefore, fine soils can hold more water than coarse soils.

6. **Water holding capacity:** The capacity of the soil to hold the water can be appraised by the parameter water holding capacity. Decomposed organic matter increases it. The water holding capacity of soil samples from the site I and II were higher than the water holding capacity of soil from site III which can be taken as control soil. Water infiltration is the movement of water from the soil surface into the soil profile. Soil texture, soil structure and slope have the maximum influence on infiltration rate. Water moves by gravity into the open pore spaces in the soil and the size of the soil particles and their spacing decides how much water can move in. Coarse soils have a higher infiltration rate than fine soils because wide pore spacing at the soil surface increases the rate of water infiltration.

Frequent irrigation is not required for the soils that can store larger amounts of water as compared to those soils that store smaller amounts. Light textured soils need to be irrigated more frequently than soils with a heavier texture. Soil samples from site III divulged the lowest porosity, particle density and water holding capacity as compared to samples from the site I and site II. pH and conductivity values were observed to be maximum in the soil samples collected from site III when compared to respective parameters from the site I and site II. Irrespective of different locations, soil samples collected from one site exhibited similar qualities for each parameter. The decrepitude of ambience is of major concern incorporating soil, forest and water. The physical characteristics of soil affect the verdure with the help of the movement of water and wind. Soil is considered one of the most important rewards of nature to mankind. Deterioration of the present environment originates from ecological damage, demographic explosion and technological overindulgence during the development process. Frequencies for soil pertained herbicides typically depend on soil texture. It has been observed that soils with lofty organic matter or great clay content are provided with higher frequencies of soil practiced herbicides. Together clay content and soil texture can be described by the electrical conductivity parameter. Conductivity maps can be easily converted into changeable rate maps for the use of pre-plant included herbicides. These uses explain very well the utility of measurement of physical features of the soil. There is a dearth of research on this aspect in the area in and around Sambhar Lake. This study will be helpful in future research concerning the ecological management of the area.

Table1: Soil Analytes (n=30) of Site I (Sambhar Lake)

Sl. No.	Analytes	Mean ±SEM	Range
1.	Ph	8.91± 0.003	8.87-9.00
2.	Bulk density, ds/m	1.246± 0.00015	1.245-1.247
3.	Conductivity, ds/m	2.275± 0.00043	2.27-2.28
4.	Particle density/cm^3	2.22± 0.00035	2.21-2.23
5.	Porosity, %	43.90± 0.035	43.88-43.92
6.	Water holding capacity, %	48.00± 0.04	47-49

Graph 1: Depiction of pH in soil samples from Sambhar Lake (Site I), Jhapok (Site II) and Phulera (Site III)

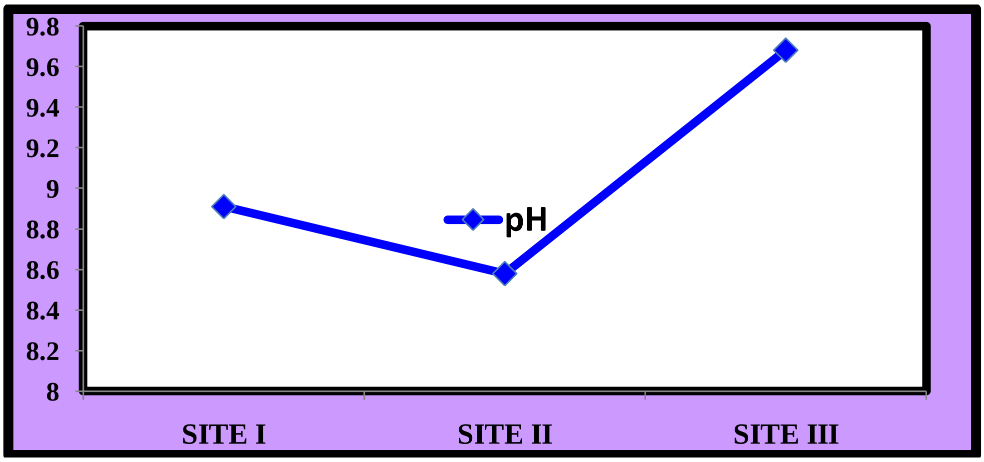


Table 2: Soil analytes (n=30) of site II (Jhapok)

Sl. No.	Analytes	Mean ±SEM	Range
1.	Ph	8.58± 0.003	8.56-8.60
2.	Bulk density, ds/m	1.50± 0.00017	1.49-1.51
3.	Conductivity, ds/m	0.805.00± 0.00030	0.80-0.81
4.	Particle density/cm^3	2.50± 0.00043	2.40-2.60
5.	Porosity, %	40.08± 0.03	39-41
6.	Water holding capacity, %	60.00± 0.06	59-61

Graph 2: Depiction of bulk density (ds/m), conductivity (ds/m) and particle density (gm/cm^3) of soil samples from Sambhar Lake (Site I), Jhapok (Site II) and Phulera (Site III)

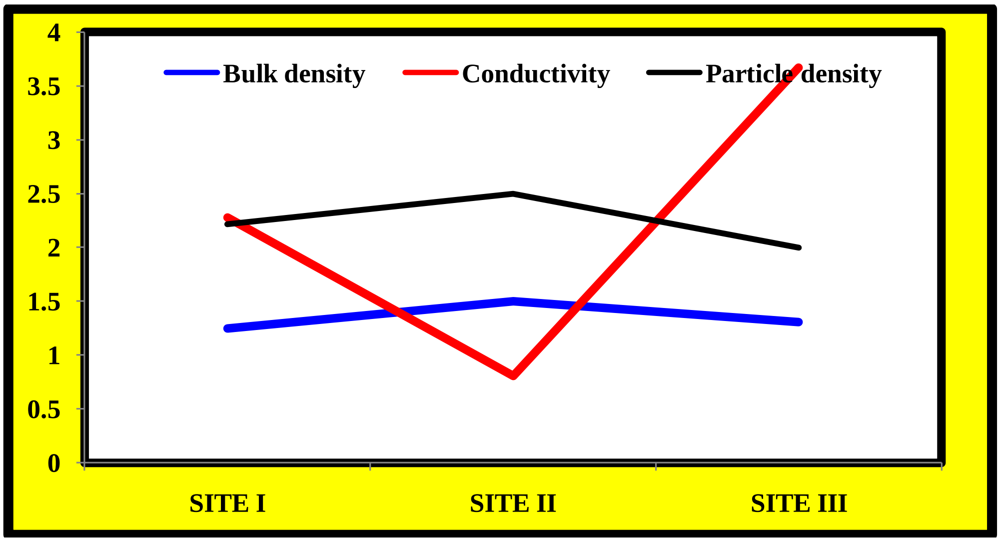
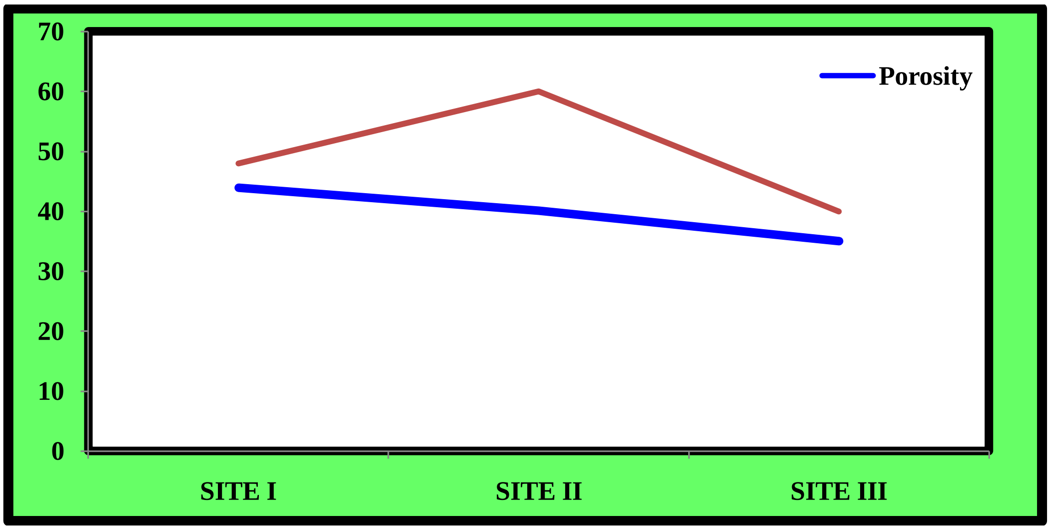


Table 3: Soil analytes (n=30) of site III (Phulera)

Sl. No.	Analytes	Mean ±SEM	Range
1.	pH	9.68±0.002	9.67-9.69
2.	Bulk density, ds/m	1.305±0.00016	1.304-1.306
3.	Conductivity, ds/m	3.67±0.00051	3.66-3.68
4.	Particle density/cm^3	2.00±0.00033	1.90-2.10
5.	Porosity, %	35.00±0.02	34-36
6.	Water holding capacity, %	40.00±0.031	39-41

Graph 3: Depiction of porosity (%) and water holding capacity (%) of soil samples from Sambhar Lake (Site I), Jhapok (Site II) and Phulera (Site III)



IV. CONCLUSION

Analysis of data revealed that soil cover having various features has a brunt on the earthly inconsistency regarding moisture and other variables. There is a paucity of work on this aspect in the area in and around Sambhar Lake, thus the result of the present study will assist to comprehend the variation of physical properties for better planning to plan ecological management. It can be suggested that for the development of a stress-free ecosystem, a proper regulatory framework for the conservation of wetlands must be executed.

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