

**PHYSICO-CHEMICAL CHARACTERIZATION OF MAHANADI
RIVER SOIL AT DHABALESHWAR, MANCHESWAR, PRASANAPUR,
KANSARIPATRA, KUNDAKHAI PATHAR AND MENDHAKHIA
PATHA, CUTTACK [ODISHA]**

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Abstract: Study was conducted for physico-chemical characterization of Mahanadi River Soil at Dhabaleshwar, Mancheswar, Prasanapur, Kansaripatra, Kundakhai Pathar and Mendhakhia Patha, Cuttack [Odisha]. Soil samples were collected from these 6 different stations for a period of one year. Soil samples were collected using spades and shovels at a depth of 15 cm and packed in thick quality zip lock polyethylene bags/pouches and transported to the laboratory. They were shade dried and stored. The dried soils were ground using mortar and pestle and sieved through a 2-mm mesh sieve. On the basis of investigations carried out, it was revealed that the Physico-chemical status of the River Mahanadi soil bed fluctuated according to the prevailing environmental conditions. pH of soil across the sampling stations was between 6.07 to 7.96. In all the stations the chloride content varied from 0.029 to 2.98 mg/gm. The organic matter values fluctuated from a low of 5.61 to 13.26%. The analysis of the soil samples collected from representative sites in the Mahanadi River revealed that the soils of the sub-basins of Dhabaleshwar, Mancheswar, Prasanapur were fertile compared to the sub-basins Mendhakhai, Kansari patha and Kundakhai (indicated by high organic content).

Keywords: Soil sample, organic matter, Soil texture.

Introduction

Soil is composed of minerals, organic matter, water, air and is a dynamic component of our ecosystem. A thorough understanding about the various physical and chemical components of the soil is one of the key processes in deducing a basic knowledge about the soil's productivity and its fertility. Soil productivity depends on its physico-chemical properties and texture, porosity of the soil affect movement of water, air and solutes. Rate of water drainage is determined by soil texture and water moves freely through sandy soils compared to clayey soil. A soil with a high percentage of silt and clay particles is more susceptible to erosion than a sandy soil and organic matter percentage is affected by the textural variation. For any river bed, particles that make up the soil is very significant. Combination of sand, silt and clay in a

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soil decide its water holding capacity and classification. Sand is the largest in particle size and clay is the smallest. Physical traits like soil density, porosity, permeability and temperature can contribute towards the characterization of the soil. The present investigation is an attempt to define the soil characteristics of the largest river bed of State of Odisha.

Materials and Methodology

The study is an important River of East Coast of India and is also referred to as life line of the State. It drains an area of around 141600sq.km and has a total course of 858 km. The river flows through the states of Chhattisgarh and Odisha. For the first 80 kms of its course, the Mahanadi flow in a northerly direction and touches eastern portions of Raipur city. After being joined by the Seonath, the river flows in an easterly direction through the remaining course .It is joined by the Jonk and Hasdeo rivers here before entering into the State of Odisha.

Plate 1: Bidanasi Ferry Ghat



The river enters the Odisha plains at Naraj which is about 11kms from Cuttack. The river traverses Cuttack district in an east west direction. Just before entering Cuttack, it gives off a large distributary called Kathajodi and enters the sea through several channels near Paradeep at False Point, Jagatsinghpur. The river Mahanadi deposits more silt than any other river in Indian subcontinent. Cuttack district is covered with deltaic sediments of Mahanadi River.

Samples for the study were collected from 6 sites namely Mancheswar ghat, Dhabelaeswar ghat, Prasanapur, Kansari patha, Mendhakhia patha, Kundakhai pathar. Soil samples were collected from these 6 different sites for a period of one year. The collected samples were analyzed to determine their physico-chemical properties. Analysis was done using Standard methods.

Sample Collection Method:

Soil samples were collected using spades and shovels at a depth of 15 cm and packed in thick quality zip lock polyethylene bags/pouches and immediately transported to the laboratory. They were shade dried and stored. The dried soils were ground using mortar and pestle and sieved through a 2-mm mesh sieve.

Soil quality parameters and its method of analysis:

Physico-Chemical Parameter	Method of Analysis
pH	Electrometric
EC (mS/cm)	Electrometric
Chlorides (mg/g)	Titrimetric
Calcium (M.eq/100g)	Titrimetric
Magnesium (M.eq/100g)	Titrimetric
Nitrate (mg/g)	Spectrophotometer
Organic Matter (%)	Wet Digestion
Soil Texture	Pipetting method

Result and Discussion

STATION	SAND%	CLAY%	SILT%
STATION 1:Dhabaleshwar	57.2	0.54	42.26
STATION 2:Mancheswar	93.46	0.12	6.42
STATION 3: Prasanapur	95.46	0.173	4.367
STATION 4: Kansari Patra	98.48	0.17	1.35
STATION 5: Kundakhai Pathar	99.03	0.16	0.81
STATION 6: Mendhakhia Patha	78.18	0.18	21.64

Table 1: Texture

Station 1: Dhabaleshwar	6.88
Station 2: Mancheswar	7.53
Station 3: Prasanapur	7.36
Station 4: Kansari Patra	7.96
Station 5: Kundakhai Pathar	7.22
Station 6: Mendhakhia Patha	6.07

Table 2: pH

Station 1: Dhabaleshwar	25° C
Station 2: Mancheswar	24.5° C
Station 3: Prasanapur	25° C
Station 4: Kansari Patra	23.8° C
Station 5: Kundakhai Pathar	24.7° C
Station 6: Mendhakhia Patha	24.9° C

Table 3: Temperature

Station 1: Dhabaleshwar	13.26
Station 2: Mancheswar	11.96
Station 3: Prasanapur	11.96
Station 4: Kansari patra	6
Station 5: Kundakhai pathar	5.61
Station 6: Mendhakhia patha	5.77

Table 4: Organic matter (%)

Station 1: Dhabaleshwar	0.588
Station 2: Mancheswar	0.868
Station 3: Prasanapur	0.616
Station 4: Kansari pathar	0.252
Station 5: Kundakhai pathar	0.252
Station 6 :Mendhakhia patha	0.294

Table 5: Calcium (M.eq/100gm)

Station 1: Dhableswar	149.412
Station 2: Mancheswar	52.432
Station 3:Prasanapur	109.384
Station 4:Kansari pathar	9.748
Station 5: Kundakhai pathar	20.748
Station 6: Mendhakhia patha	10.706

Table 6: Magnesium (M.eq/100gm)

Station 1: Dhableswar	0.029
Station 2: Mancheswar	0.029
Station 3: Prasanapur	0.029
Station 4: Kansari pathar	1.988
Station 5: Kundakhai pathar	1.988
Station 6: Mendhakhia patha	2.982

Table 7: Chloride (mg/gm)

Station 1: Dhableswar	5.88
Station 2: Mancheswar	1.47
Station 3: Prasanapur	0.735
Station 4: Kansari pathar	0.0171
Station 5: Kundakhai pathar	0.0163
Station 6: Mendhakhia patha	0.0105

Table 8: Conductivity (ms/cm)

Soil Texture

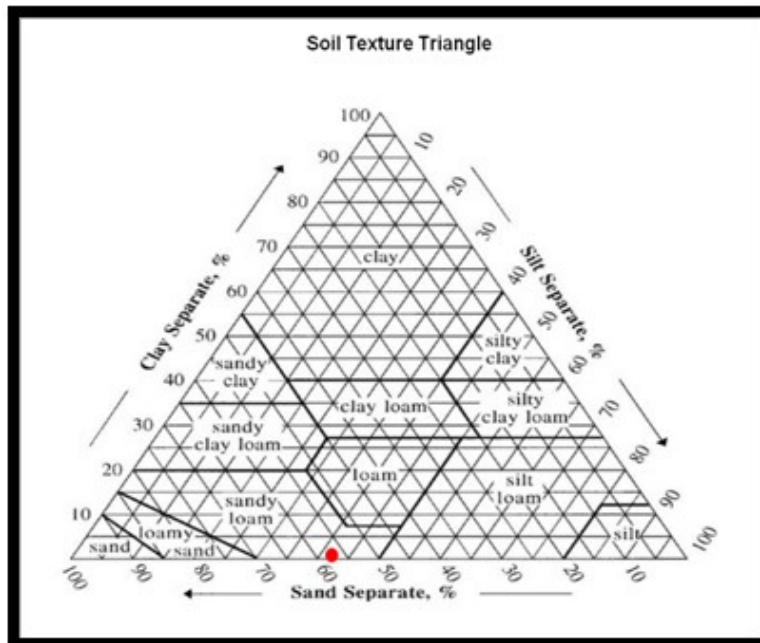


Fig 1.1: Station 1- Sandy Loamy

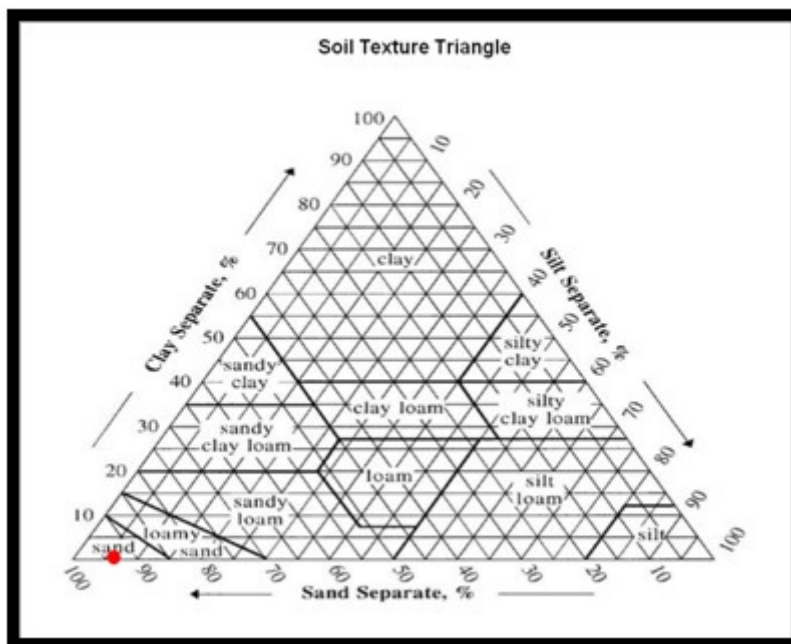


Fig 1.2: Station 2 Sandy Soil

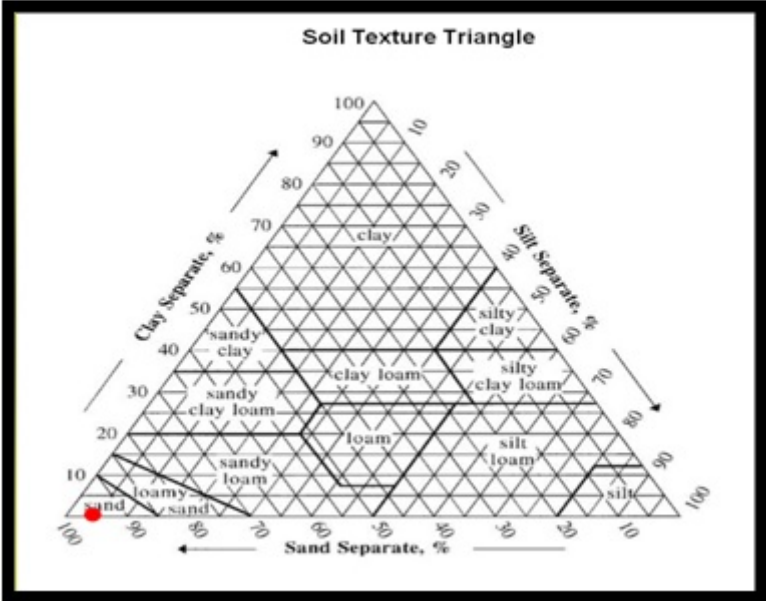


Fig 1.3: Station 3- Sandy Soil

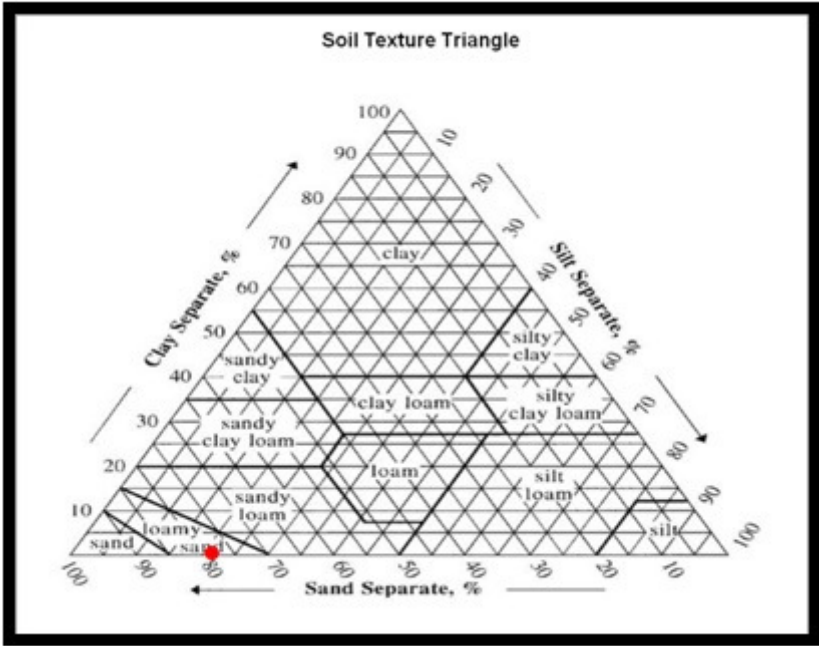


Fig 1.4: Station 4-Sandy Soil

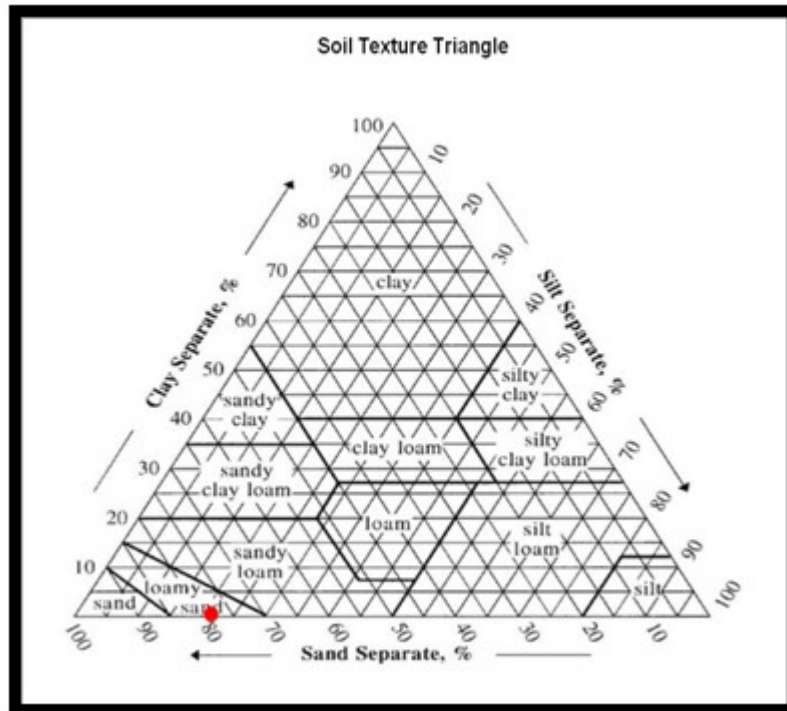


Fig 1.5:Station 5-Sandy Soil

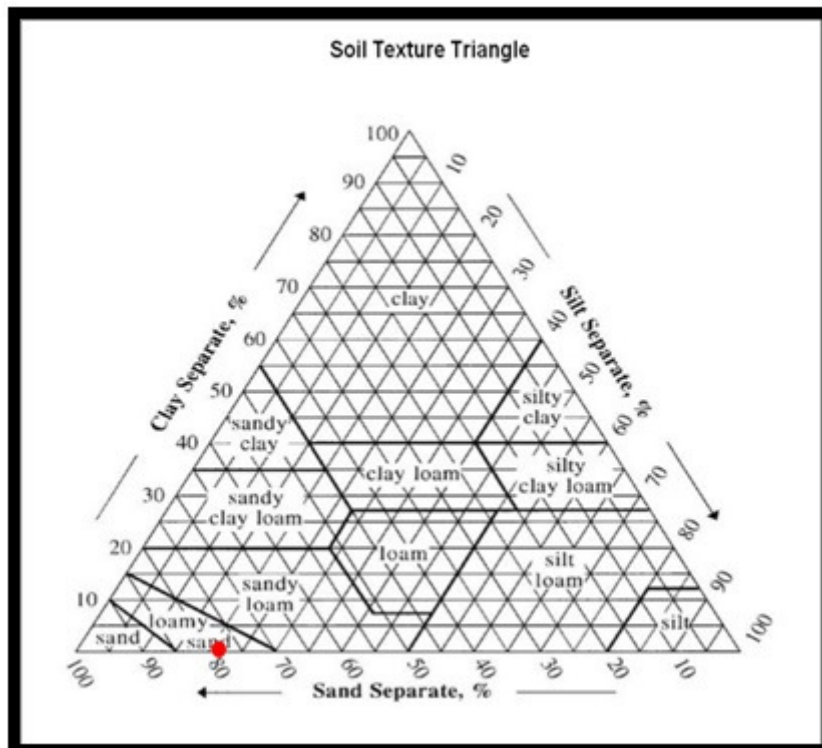


Fig 1.6:Station 6-Loamy Sand Soil

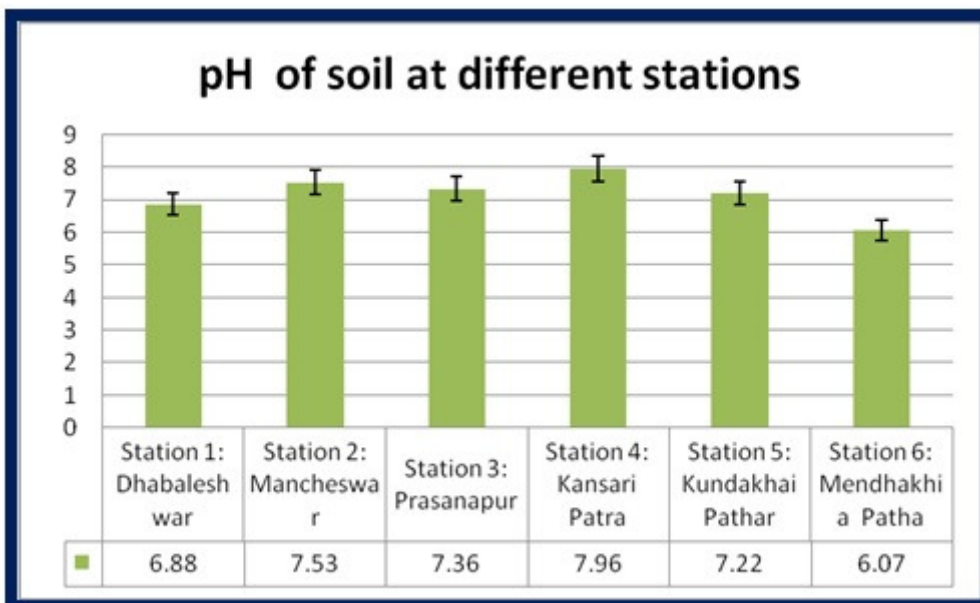


Fig 2: pH Of Various Sampling Station [S1-S6]

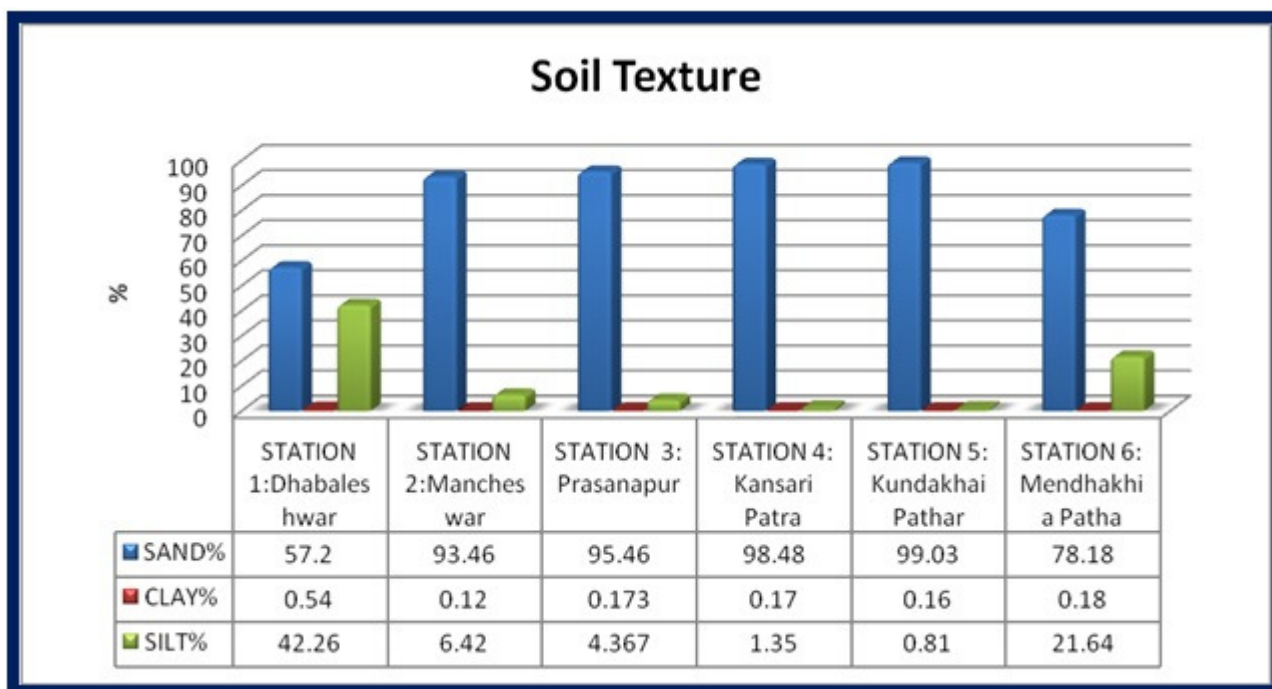


Fig 3: Soil Texture (%) [S1-S6]

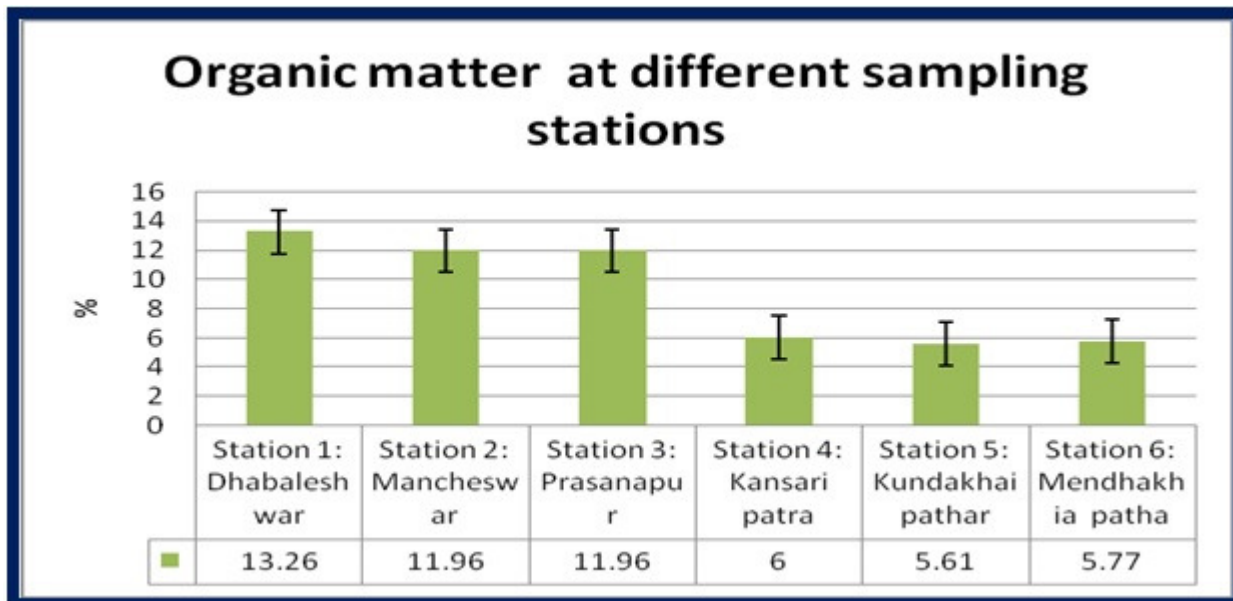


Fig 4: Organic matter (%) [S1-S6]

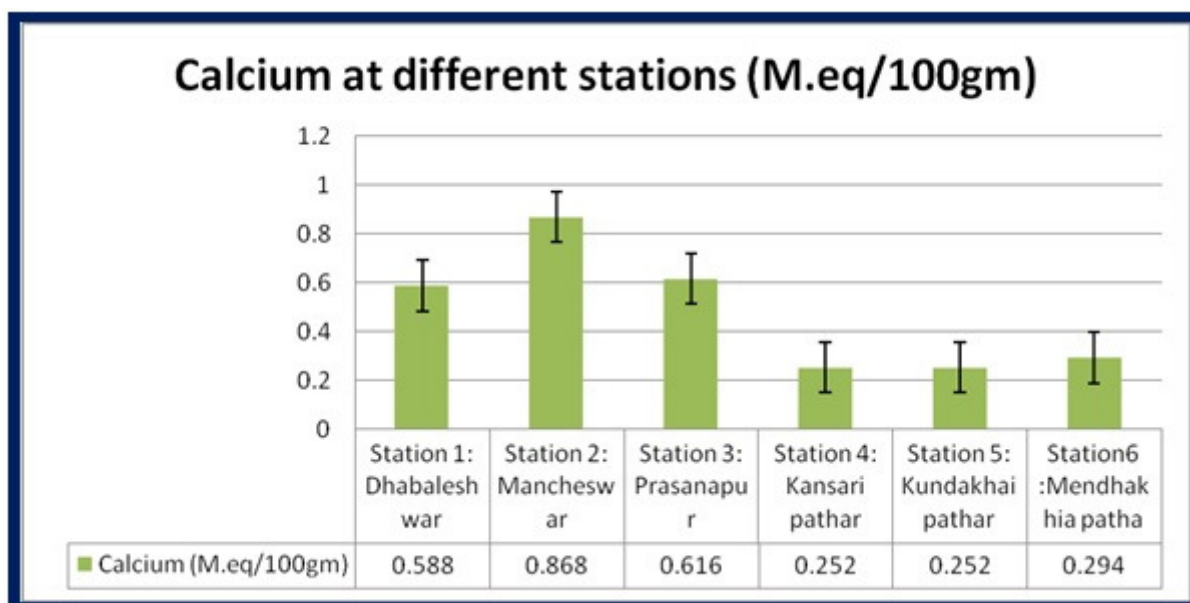


Fig 5: Calcium [S1-S6]

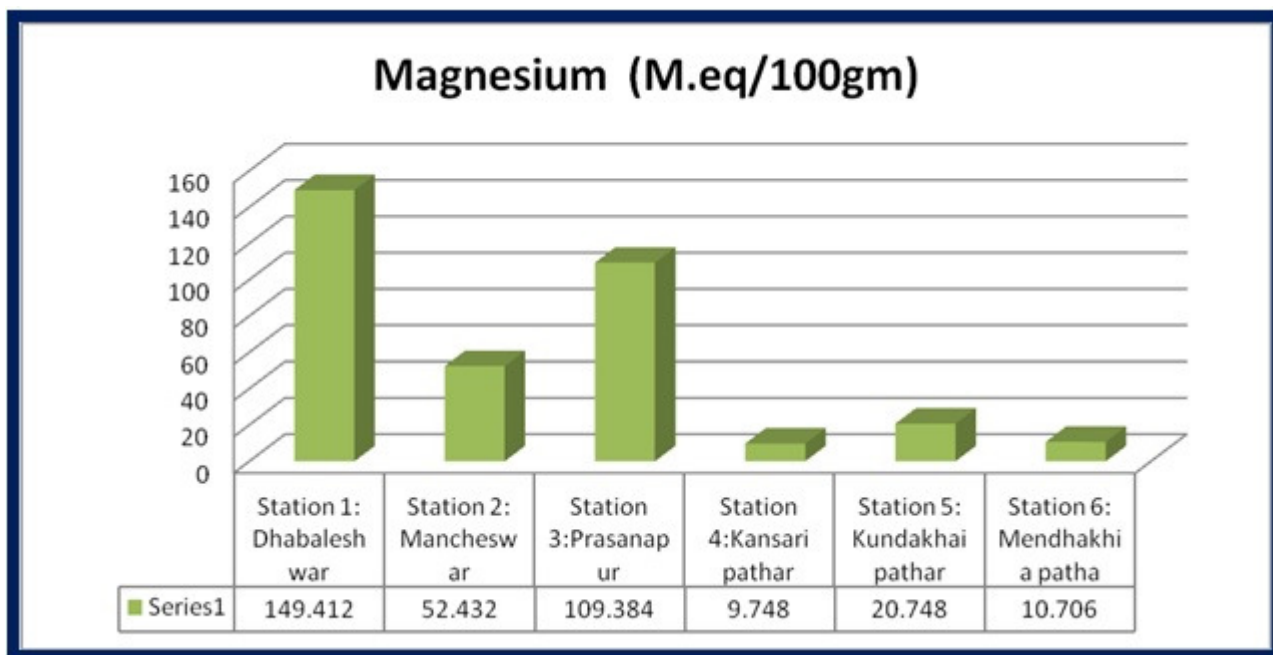


Fig 6: Magnesium [S1-S6]

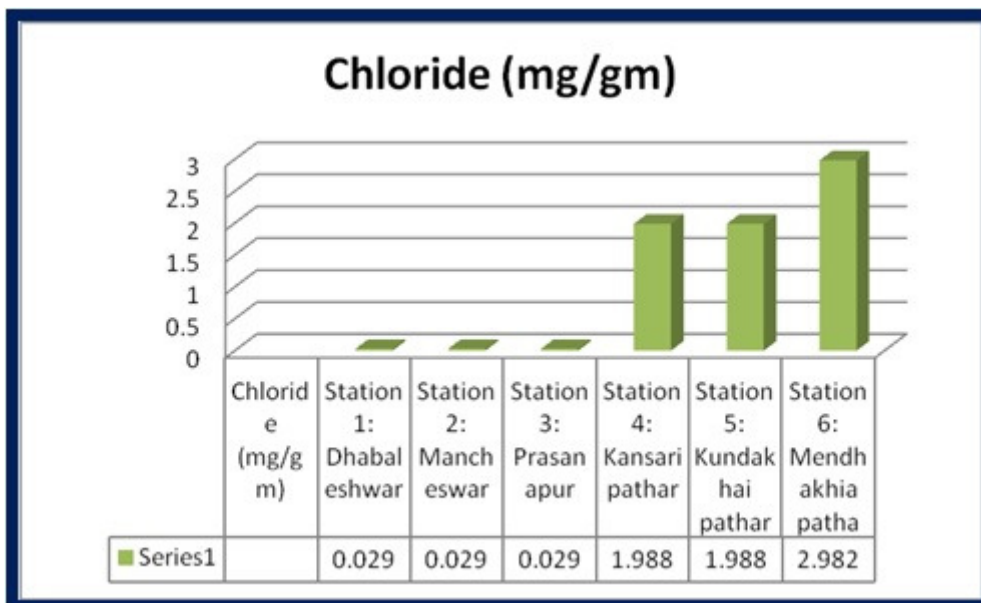


Fig 7: Chloride(mg/gm) [S1-S6]

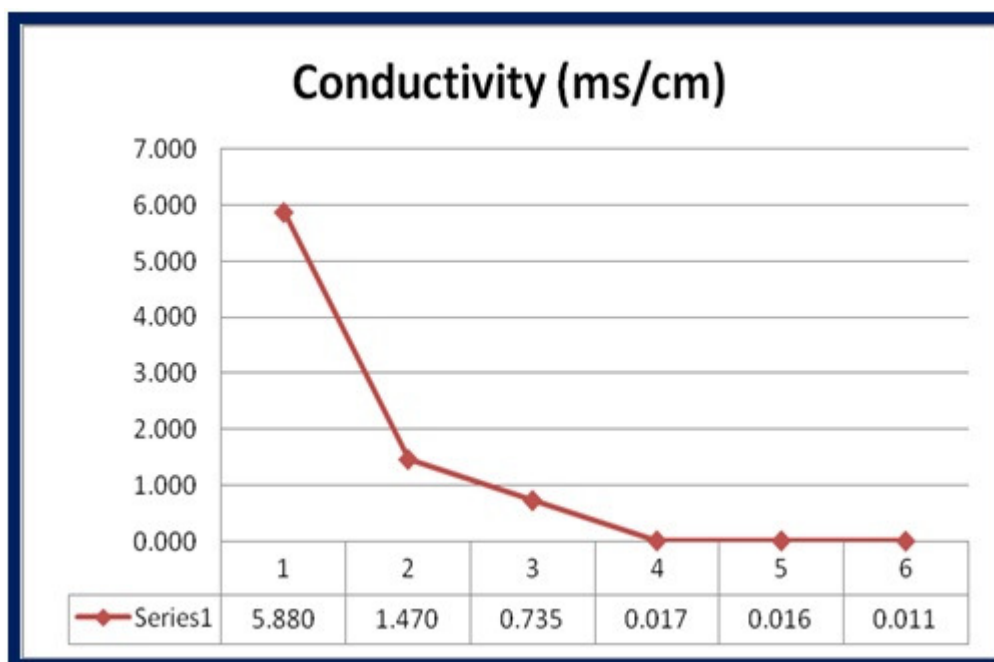


Fig 8:Conductivity(ms/cm) [S1-S6]

On the basis of investigations carried out, it was revealed that the Physico-chemical status of the River Mahanadi soil bed fluctuated according to the prevailing environmental conditions. pH of soil across the sampling stations ranged between 6.07 to 7.96. At all the stations the chloride content varied between 0.029 to 2.98 mg/gm. The organic matter values fluctuated from a low of 5.61 to 13.26%. Calcium concentration ranged within 0.252 -0.868M.eq and magnesium concentration recorded at sampling stations was between 9.748 to 149.41 M.eq. Conductivity values were found to be within 0.011 to 5.880 ms/cm. The analysis of the soil samples collected from representative sites in the Mahanadi River revealed that the soils of the sub-basins of Dhabaleshwar, Mancheswar, Prasanapur were fertile compared to the sub-basins Mendhakhai, Kansari patha and Kundakhai (indicated by high organic content). The investigation also helped in assessing the amount of nutrients available in a particular soil. Hence, a soil test constitutes an important component in the management and monitoring of soil quality.

Discussion

Soil analysis can provide information about productivity which is essential as it influences the distribution of flora and fauna of soil bed. Soil degradation is one of the serious environmental problems in the world and physico chemical characterization will help in formulating policies and plan for conserving and minimizing soil erosion of Mahanadi soil

bed. The determination of total organic carbon is an essential part of any sampling site characterization since its presence or absence can influence how chemicals will react in the soil or sediment. Carbon can be present in elemental, inorganic, or organic forms and is usually derived from weathering of the parent material, the decomposition of plant and animal matter, or by addition through anthropogenic activities. River soils are carried and deposited by the flow and action of rivers. Soil in river areas can be especially complicated due to the materials that rivers bring in from different areas. The texture of soil affects its ability to hold nutrients. Sand particles are the largest and allow water to move through the soil more quickly. Organic matter % of Mahanadi river basin is comparatively good and the basin seems to be richer and fertile which favours growth of microorganisms naturally found in the soil. Soil analysis can help making soils more productive through management plan after thorough evaluation of physico-chemical properties (Abua, 2012). The analysis of the soil samples collected from various sites in the Mahanadi River revealed that the soils of the sub-basins of Dhabaleshwar, Mancheswar, Prasanapur were more fertile compared to the sub-basins Mendhakhai, Kansari patha and Kundakhai based on organic matter. A detailed soil survey can help to understand deeply the river bed profile of Mahanadi basin. Agricultural activities like excess use of fertilizers, pesticides are responsible for deterioration of river bank soil. This results in an imbalance of physico-chemical characteristics of soil (Ingavale, 2012). The study indicates that most of the sampled areas have not been affected much by anthropogenic activities as indicated by high organic matter percentage. Detailed field experiment supported by analysis of toposheet in near future will provide more insight about River Mahanadi soil bed.

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