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Soil Texture Analysis and Sediment parameters of Halda River, Chattogram.

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Abstract

The Halda River is one of the important river of Chittagong district which is one of the natural breeding ground of major carps in Bangladesh. The present study attempted on the physicochemical parameters and seasonal variability of the sediment of the Halda River. Soil Temperature, pH, texture, organic matter, organic carbon were analyzed by standard procedure at the laboratory of the institute of Marine Sciences,University of Chittagong. The range of the soil Temperature, pH, sand, silt, clay, organic matter and carbon were 27°C-32°C, 6.4-6.7, 54.43–41.00%, 20.70–29.70%, 20.92–29,10%, 3,29-4,355%, 1.112-2,520% respectively. Seasonal variation was observed with significant deviation during the monsoon due to heavy precipitation and heavy runoff from the upstream of Halda River. We need to take proper measure to conserve this unique aquatic natural body.

Keywords: Sediment; Halda River; Soil; Organic matter; Organic Carbon; Silt; Clay; Sand.

1. Introduction

Soil often called the skin of organic Earth, is a matter of decaying organic matter humus,minerals, liquids, and many countless living organisms. Soil covering the earth is a medium for plant growth and a means of water storage. Soil texture is one of the most stable properties and useful index of several other properties that determine the agricultural potential of soil. The Halda River is one of the most important rivers of Bangladesh. It is located in Chattogram. The Halda River rises from the Badnatali hill ranges in the Chattogram hill tracts and enter Chattogram district through Fatikchari upazila. It flows over Fayikchari, Hathazari, Raozan, kotwali, Nazirhat etc. oxbow-bends of Halda River are known to be prepared zone of major carps for breeding and spawning. The geographical location of the Halda River is between 22°56'07" to 22°42'11" N latitude and 91°37" to 92" E longitude. Halda is the third river of Chittagong district and has become the effecters of development providing fresh water supply, fish production, transportation and waste assimilation provision along with a great array of recreation and tourism option. Halda has a unique feature since it is the only natural breeding ground of major carps in Bangladesh (Kabir et al., 2013). Spawning area of this river extended from Garduara to Madunaghat where a total of 1100 egg collectors and 200 fisherman catch fish throughout the year (Islam, 2009).

1.2 Objective of the study

This research work includes the following objectives-

1.To determine the concentration of organic matter and organic carbon from the
sediments of the Halda River.
2. To analyze the seasonal variation of the soil texture of the sediments.

2 Materials and Methods

2.1 Study Area

The Halda in one of the important rivers in Bangladesh in Chittagong district. It is located between 22°56'07" to 22°42'11" N latitude and 91°37" to 92" E longitude. It is considered as the natural breeding ground of fish. Its source of origin and water boundary concluded within Bangladesh. The Halda River starts from the north Chittagong hill tracts area and flows into the Karnafully River Samples were collected from two stations like Modunaghat bridge and Ramdas Hut. The exact location is marked below:
Table 01: Location of sampling stations

Stations	Location	Latitude	Longitude
Station-01	Modunaghat Bridge	22°26'6.1" N	91°52'22.89" E
Station-02	Ramdas Hat	22°27'2.3" N	91°55'19.35" E

2.2 Study Period

Monsoon:16th May, 2019
Post Monsoon:16h September, 2019
Post Monsoon: 20th December, 2019

2.3 Sample collection and preparation

Soil Sampling

Soil samples were collected from two stations with two replicates. So, a total of 4 samples were collected from the selected stations.

Sample preservation

Soil samples were preserved in air tight polythene to reduce oxidation of carbon.

Soil sample preparation

The following steps were taken for preparing the samples-
1. After collecting the soil samples, they were air dried.
2. Then the samples were grinded by using mortar and pestle.
3. Then the grinded samples were sieved by using 0.3mm sieve.
4. Finally the fine grinded particles were stored in air tight polythene bag for farther analysis.

2.4 Determination of carbon from collected sample

A dry ignited porcelain crucible was weighed. Then about 2gm of soil was taken in the crucible and weighed again. Then the sample was dried in an oven at 105°C. The oven dried sample was ignited in a muffle furnace at 550°C for 2 hours. Afterwards the crucible was transferred to a desiccators to cool up to room temperature. The crucible and the ignited soil was weighted again. The net loss in weighed is the organic matter of the soil obtained.

Calculation:

% Organic Matter in sediment = (W2-W3)×100/(W2-W1)
Where,
W1= Weight of crucible
W2= Weight of (crucible + soil) before ignition.
W3= Weight of (Crucible + soil) after ignition.
Determination of soil organic carbon=% Organic Matter ÷1.724.

2.5 laboratory Analysis

In the laborntory all soil sample were mixed thoroughly in equal portion to prepare a composite portion All soil samples were ait dried at room temperature and then powdered, and passed through a 5mm mesh sieve separately. Finally soil sample were over dried at 60°C for 24 hours

2.6 Soil Texture

Soil texture is a classification instruments used both in the field and laboratory to determine soil classes based on their physical texture. The relative size of the soil particles is expressed by the term texture which refers to the fineness or coarseness of the soil.

2.7 Regents

NaOH solution: 40g NaOH crystals was taken in a 1000ml volumetric flask. It was dissolved in distilled water, cooled and the volume was made up to the mark with distilled water.

2.8 Procedure

25gm oven dry soil (60°C) was taken in a 500ml beaker and 50ml distilled water wasadded, the contents were stirred thoroughly with a glass rod for

half an hour, then 10ml IN NaOH solution was added stirred thoroughly and the contents were transferred quantitatively into a homogenized cup with repeated washing, the material was thoroughly homogenized and transferred to a 1000ml sedimentation cylinder, the volume was made up to the mark with distilled water, this was stirred thoroughly to prepare a uniform suspension the suspension was allowed to settle and reading with a Bouyoucos soil hydrometer and a thermometer were taken exactly after 4 minutes and 2 hour, a similar blank was run without soil but with the addition of 10ml IN NaOH solution to distilled water.

2.9 Calculation

Temperature correction of hydrometer reading

$X1 = X1' + (t1 - 19.4) \times 0.3$
$X2 = X2' + (t2 - 19.4) \times 0.3$

Where,
X1= corrected hydrometer reading after 4 minutes
X2=corrected hydrometer reading after 2 hour
X1'= Hydrometer reading of soil suspension after 4 minutes
X2'=Hydrometer reading of soil suspension after 2 hour
t1= Temperature of soil suspension after 4 minutes
t2= Temperature of soil suspension after 2 hour

$\% \text{ of Sand} = \{1 - (X1 - Xb1/w\} \times 100$
$\% \text{ of silt} = \{(X1 - Xb1/w\} \times 100$
$\% \text{ of clay} = \{(X2 - Xb2)/w\} \times 100$

Where,

Xb_1=blank hydrometer reading after 4 minutes.
Xbz=blank hydrometer reading after 2 hour
W= weight of oven dry sediment

3. Results and Discussion

3.1 Physicochemical properties of sediment of the Halda River

Samples were analyzed for monsoon and post monsoon at each stations Physicochemical properties or parameters of the Halda River sediment within the investigated area are shown below:

3.11.1 Soil Temperature

Soil temperature in the investigated area varied from 27°C to 32°C. The highest temperature was recorded during post monsoon (September). And lowest temperature was recorded in December.

3.1.2 Soil pH

Soil pH is ranged from 6.4-6.7 in the study area. The highest soil pH was recorded in station both 1 and 2 in the monsoon period. The average value of soil pH in both samples and stations are respectively 6.5 in monsoon and is 6.5 and 6.45 in post monsoon period.

3.1.3 Sand (Table 02, Figure 01)

% of Sand in sediment of the Halda River varied from 54.43 - 41.00%. Highest value was determined during post-monsoon at station 02 whereas lowest value was noticed at station 02 during pre-monsoon.

3.1.4 Silt(Table 02, Figure 02)

% of Silt in sediment of the Halda River varied from 20.70 -29.70%. Highest value was determined during pre-monsoon at station 01 whereas lowest value was noticed at station 02 during pre-monsoon.

3.1.5 Clay(Table 02, Figure 03)

% of Clay in sediment of the Halda River varied from 20.92 - 29.10% Highest value was determined during post monsoon at station 01 whereas lowest value was noticed at station 01 during monsoon,

3.1.6 Organic Matter (Table 02, Figure 04)

Organic Matter (OM) of sediment of the Halda River varied from 3.29-4.355%. Highest value was determined during post-monsoon at station 01 and monsoon at station 01, whereas lowest value was noticed at station 01 during pre-monsoon.

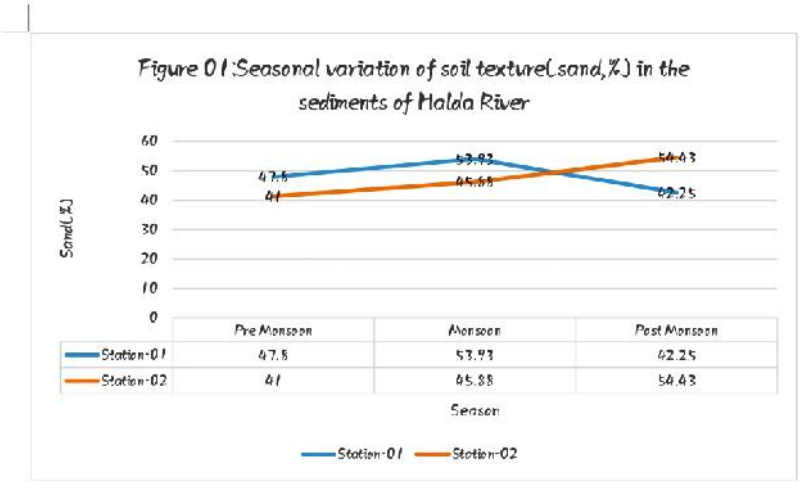
3.1.7 Organic Carbon (Table 02, Figure 05)

Organic Carbon (OC) of sediment of the Halda River varied from 1.112-2.520%. Highest value was determined during post-monsoon at station 01 whereas lowest value was noticed at station 01 during pre-monsoon.

Table-02: Seasonal variation of soil texture, OM, OC of the sediments of Halda River.

Season	Station	Clay(%)	Silt(%)	Sand(%)	OC(%)	OM(%)
PreMonsoon	St-01 St-02	22.50 38.3	29.7 20.70	47.8 41.0	1.112 1.982	3.29 3.58
Monsoon	St-01 St-02	20.92 26.04	25.15 28.08	53.93 45.88	1.525 2.190	4.355 3.685
PostMonsoon	St-01 St-02	29.10 21.54	28.65 24.03	42.25 54.43	2.520 1.78	4.355 3.685

According to Saikat (1995) the near shore region is mainly alluvial deposited composed of fine grained sand, silt clay and there percentage is higher which is similar to the present study.



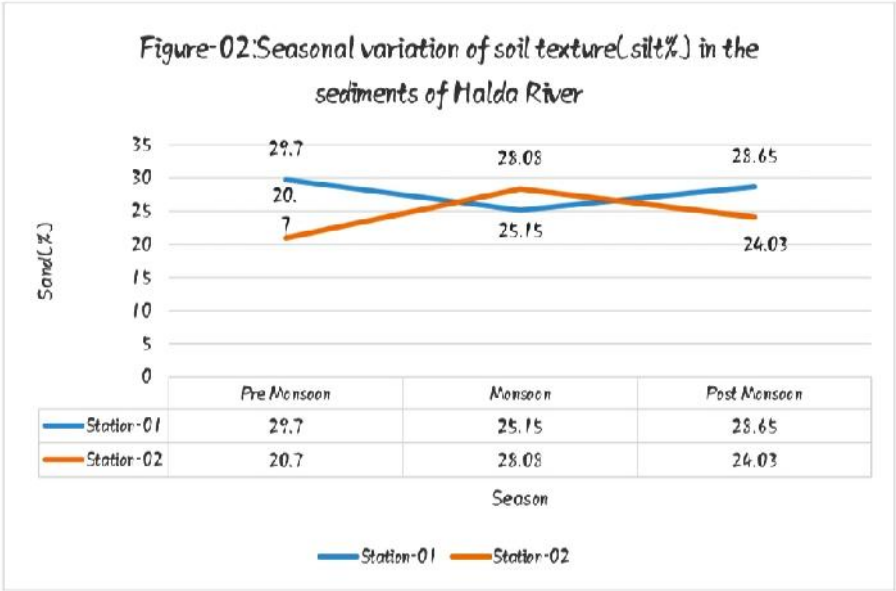
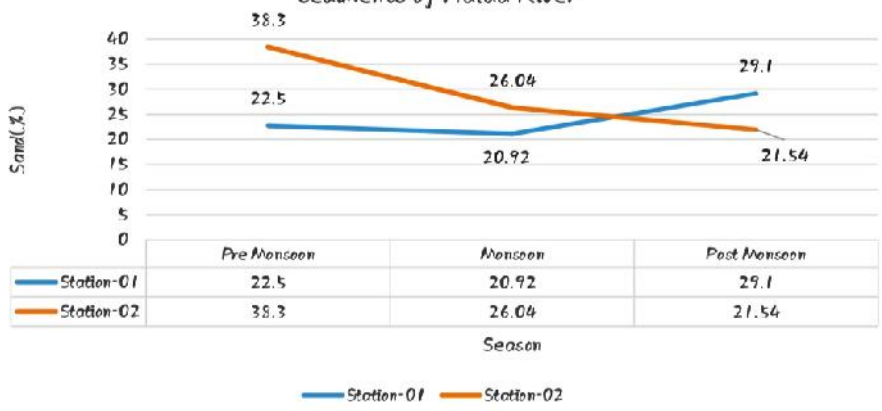


Figure-03:Seasonal variation of soil texture(clay%) in the sediments of Halda River



Seasonal variation of Organic Matter(%) in the sediments of Halda River

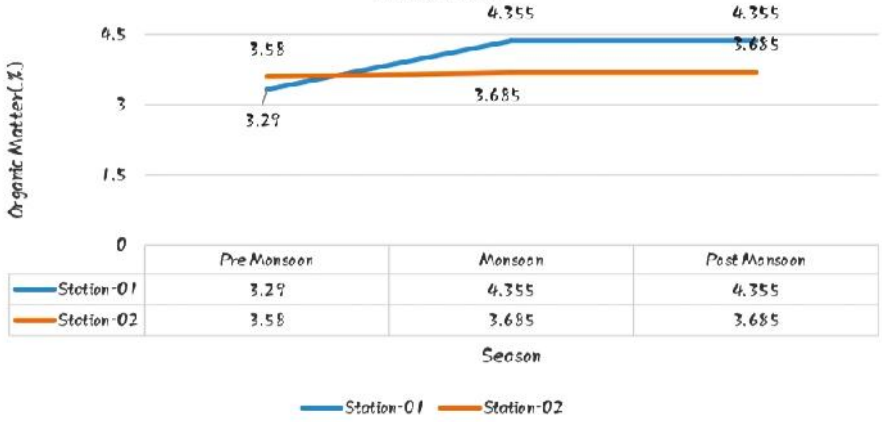


Figure-05:Seasonal variation of Organic Carbon(%) in the sediments of Halda River

Conclusion

Various industrial activities, commercial activities, power plant discharge, human wastes untreated effluents and pollutants are responsible for the deterioration of water quality and sediment nature of study area. Physicochemical parameters and soil texture were maintaining a seasonal trend, which are remarkable to our subtropical coastal region. The amount of organic carbon in the study river found liberally moderate. It also varied monthly throughout the year. So the mitigation should be taken immediately to prevent pollution and protect aquatic resource.

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