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A STUDY ON SILT LOAD ON RIVER BRAHMAPUTRA AND SOME OF THE MAJOR TRIBUTARIES IN LOWER ASSAM

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Abstract: Sediment is a naturally occurring material that is broken down by processes of weathering and erosion and is subsequently transported by the action of wind, water or ice or by the force of gravity acting on the particles. Stronger flows will increase the lift and drag on the particle, causing it to rise, while larger or denser particles will be more likely to fall through the flow. The rate of sediment transport is associated to several variables such as water discharge, average flow rate, stream power, energy slope, shear stress, water depth, particle size, water temperature, and strength of turbulence. Throughout the low transport stages, particles move by sliding and rolling over the surface of the bed. With the increase of the velocity, the sediment is entrained into suspension and travels significant distances before being deposed again. This report discusses about the effect of silt on Brahmaputra River in lower Assam by taking the sample using depth integrating sampler technique from different location on river Brahmaputra and its tributaries at different depth during the period of autumn and rainy season. Sediments were separated from the collected samples by the process of filtration in the laboratory. Aim of this study is to analyse the variation of sediment load at shallow depth & contribution of some of tributaries to the river Brahmaputra.

Keywords: Sediment movement, silt, discharge, sliding and rolling, Brahmaputra River

I. INTRODUCTION

The River Brahmaputra is one of the biggest rivers of the world. This river is a trans-boundary river which flows through China, Bangladesh and India. In Upper Assam, near Dibrugarh, the river is 16 km wide where as in lower Assam at Pandu, near Guwahati the Brahmaputra is 1.2 km wide but in the immediate downstream the width is nearly 18 km wide. These rivers converge in Bangladesh as river Meghna and flow out to the Bay of Bengal. It traverses eastward for a distance of nearly 1,200 km, in the longitudinal direction, it is known as the Tsangpo**.** It enters to Indian subcontinent to the west of Sadiya town in Arunachal Pradesh. After flowing southwest, it receives its main left bank tributaries, i.e**.,** Dibang or Sikang and Lohit; thereafter, it is called as the Brahmaputra**.** The Brahmaputra features among the world's top five rivers in terms of discharge as well as the sediment it brings. In terms of sediment yield, two spots along the Brahmaputa's course were at second and third places in 2008, behind the Yellow River. The Brahmaputra's annual sediment yield was 1,128 tonnes per sq km at Bahadurabad of Bangladesh, and 804 tonnes per sq km at Pandu of Guwahati. The vast amount of sediment comes from Tibet, where the river originates. Also the river when enters Assam, a state comprising primarily floodplains surrounded by hills on all sides, deposits vast amounts of this silt, leading to erosion and floods.

II. STUDY AREA

Sites from the lower Assam region are taken into consideration. We have collected sample from different locations on river Brahmaputra and some of its tributaries at different depth.

III.SAMPLE SOURCE

We used depth integrating sampler technique to obtain a sample that accounts for different sediment concentrations throughout the vertical profile of the point. Sampler has a water inlet and an air outlet as the water and suspended sediment enter air is displaced through the air outlet. Sampler has a metal body that encloses a metal cylinder for retaining the sample and a shutter is there at the mouth of the cylinder. In the point, depth integrating sampler is lowered to the river at required depth, then the shutter is open with the help of switch given at the top of the handle. The objective is to fill the

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sampler at the depth, so the shutter is kept closed till we get the depth required. For sediment analysis, samples were collected with help of sampler at u/s junction of tributaries and river Brahmaputra at different depth.

TABLE 1. SEDIMENT LOAD FOR THE TRIBUTARIES IN LOWER ASSAM (DURING AUTUMN SEASON)

Sample No.	Location	District	Latitude & Longitude	Depth below water level (m)	Concentration PPM
1.	Palashbari	Kamrup	26.129376 91.546607	0	32
2.	Palashbari			0.5	68
3.	Palashbari			1	192
4.	Kulsi	Kamrup	26.072753 91.429742	0	10
5.	Kulsi			0.5	126
6.	Kulsi			1	94
7.	Pandu	Kamrup	26.171890 91.686148	0	50
8.	Pandu			0.5	50
9.	Pandu			1	184
10.	Kolohi	Kamrup	26.047963 91.388969	0	2
11.	Kolohi			0.5	18
12.	Kolohi			1	60
13.	Dharapur	Kamrup Metro	26.148755 91.629678	0	180
14.	Dharapur			0.5	180
15.	Dharapur			1	188
16.	Sadilapur	Kamrup	26.170079 91.669849	0	528
17.	Sadilapur			0.5	232
18.	Sadilapur			1	244
19.	Kachari	Kamrup	26.193 91.7521	0	296
20.	Kachari			0.5	110
21.	Kachari			1	166

TABLE 2. SEDIMENT LOAD FOR THE TRIBUTARIES IN LOWER ASSAM (DURING RAINY SEASON)

Sample No	Location	District	Latitude & Longitude	Depth below water level (m)	Concentration PPM
1.	Palashbari	Kamrup	26.129376 91.546607	0	770
2.	Palashbari			0.5	360
3.	Palashbari			1	516
4.	Kulsi	Kamrup	26.072753 91.429742	0	144
5.	Kulsi			0.5	94
6.	Kulsi			1	186
7.	Pandu	Kamrup	26.171890 91.686148	0	186
8.	Pandu			0.5	232
9.	Pandu			1	284
10.	Kolohi	Kamrup	26.047963 91.388969	0	130
11.	Kolohi			0.5	108
12.	Kolohi			1	190
13.	Dharapur	Kamrup	26.148755 91.629678	0	382
14.	Dharapur			0.5	282
15.	Dharapur			1	288
16.	Sadilapur	Kamrup	26.170079 91.669849	0	328
17.	Sadilapur			0.5	288
18.	Sadilapur			1	378
19.	Kachari	Kamrup	26.193 91.7521	0	228
20.	Kachari			0.5	358
21.	Kachari			1	316

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IV. RESULTS

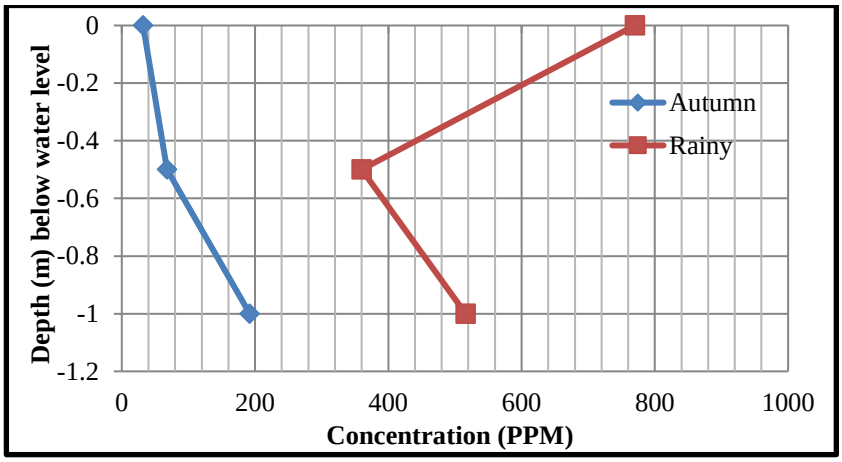

Fig.-1: Sediment Concentration vs. Depth (River Brahmaputra at Palasbari site)

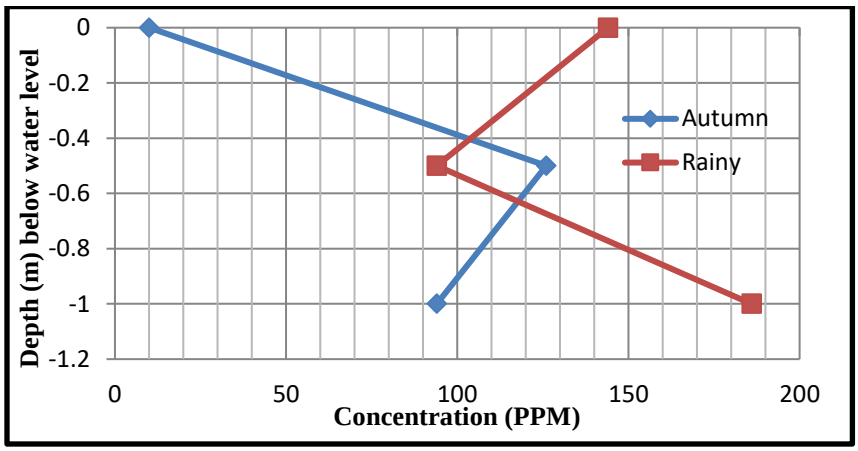

Fig.-2: Sediment Concentration vs. Depth (River Kulsi at Kukurmara site)

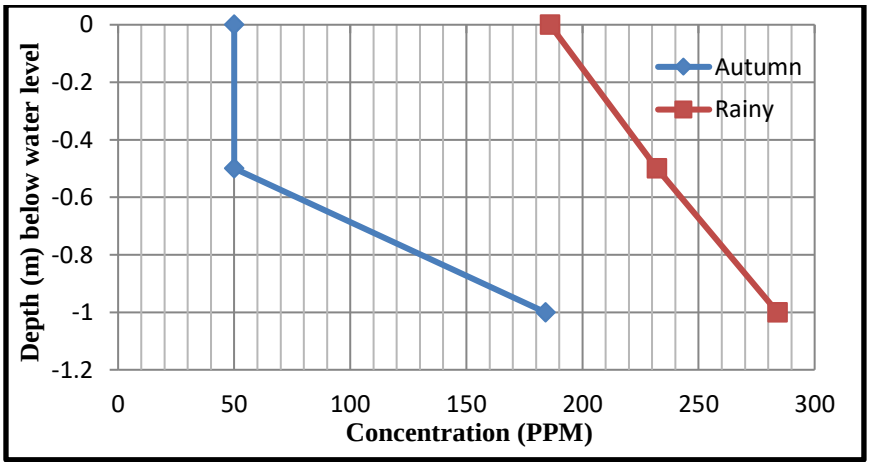

Fig.-3: Sediment Concentration vs. Depth (River Brahmaputra at Pandu site)

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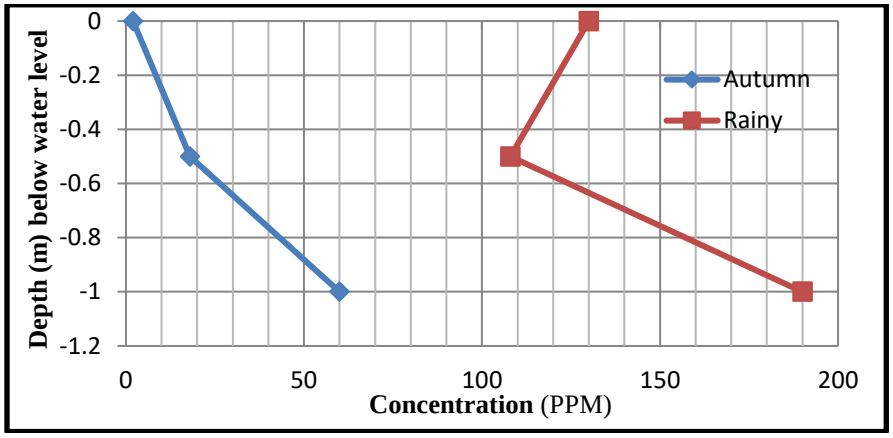

Fig.-4: Sediment Concentration vs. Depth (River Kolohi at Chayagaon site)

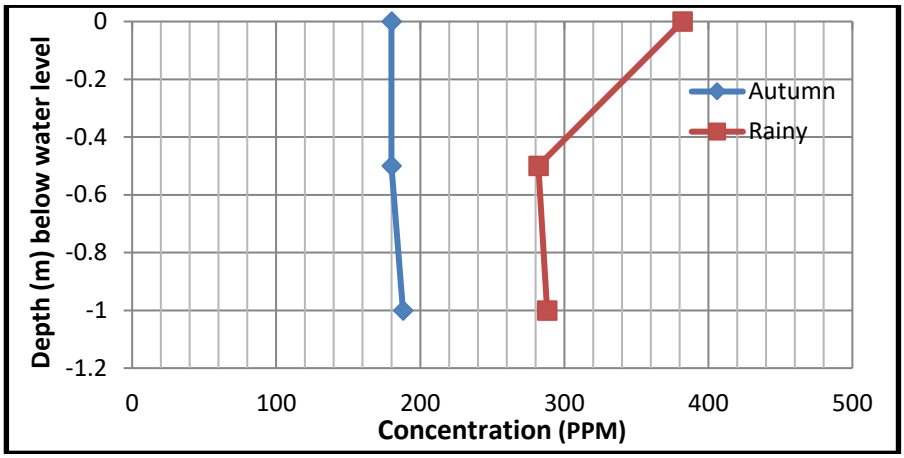

Fig.-5: Sediment Concentration vs. Depth (River Brahmaputra at Dharapur site)

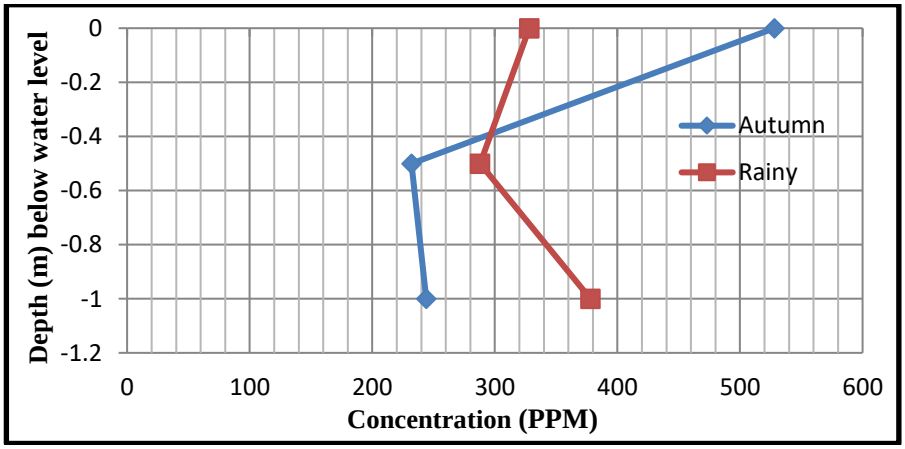

Fig.-6: Sediment Concentration vs. Depth (River Brahmaputra at Sadilapur site)

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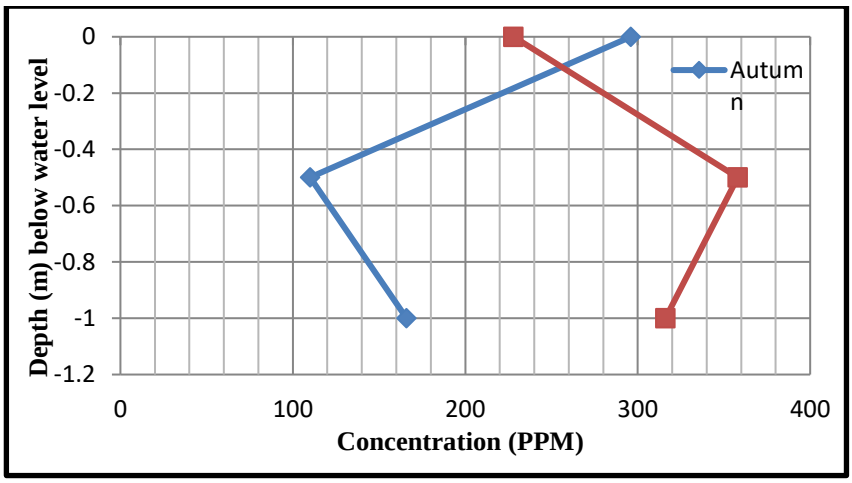

Fig.-7: Sediment Concentration vs. Depth (River Brahmaputra at Kachari site)

V. CONCLUSION

Water samples were collected at 7 different locations one each in 2 tributaries (Kolohi and Kulsi) and five location at Brahmaputra River at different depth from water level during autumn season (Nov'2019) and in rainy season (July'2020). From the analysis of test results it has been observed that sediment concentration at river Kolohi at Chayagaon site during autumn season is very low (2 mg/l). During rainy season, maximum sediment concentration was observed at Palasbari site of river Brahmaputra (770 mg/l) on July 21, 2020. During autumn season, sediment load of river Brahmaputra at Palasbari site and river Kolohi at Chayagaon site shows increasing trend with depth but in rainy season no generalised trend has been observed i.e., fluctuating in nature. In river Kulsi at Kukurmara site no specific trend between sediment load & depth being observed. In river Brahmaputra also, no generalised trend can be drawn between sediment load & depth at all the 5 sites. In Pandu site, during autumn season sediment concentration up to 0.5 m remains same and then it increases with depth. But during rainy season, as depth increases, sedimentation concentration also increases. During autumn at Dharapur site of river Brahmaputra, sediment concentration remains constant up to 0.5m depth and then it increases. But during rainy season sediment concentration does not follow any specific trend along depth. In Sadilapur and Kachari site of river Brahmaputra does not appear any specific trend i.e., it varies in nature. So, by observing the results the sediment concentration trend cannot be generalised as depth wise.

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