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Soil Analysis of Gandak River Near Akharaghat, Muzaffarpur and Its Impact On Aquaculture

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ABSTRACT
Soil of river Gandak was found to be within the range of normal conditions for aquaculture process especially the fish culture. Favourable PH range, comparatively high phosphate content during monsoon and presence of moderate amount of organic compounds were observed on the analysis of soil of this river. The organic carbon content by and large remained in the range of moderate productivity being higher during post monsoons and winter seasons. Calcium and magnesium contents were also detected in applicable amount from the soil of the river. The complete absence of carbonate was probably due to its frequent and immediate conversion in to biocarbonates. The percentage of silica in the form of silica oxide was in the range from 50% to 60%. Its high percentage during mansoons was probably due to its addition to existing amount in course of incoming of silica content alongwith flood water.
Keywords: Soil analysis, Gandak-River, Akharaghat, Muzaffarpur, Aquaculture.

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INTRODUCTION

Soil is one of the most important ecological factors. It plays a significant role in the productivity of a water body as it is one of the essential prerequisites to the aquaculture being the chief storage medium of all the nutrients, the vegetation depends much upon the soil conditions right from its germination. The favorable soil condition provides better opportunities for the production of plankton population as well as the macro-flora and fauna of a water body. The mineral composition of water is largely a reflection of the soil of water bodies.

Correlation between physic-chemical and biological factors for Indian freshwaters bodies was reported for the first time in 1940 [2]. This was reported that the abiotic factors were on peak in summer with sudden decline during monsoon period [5]. Physico-chemical factors were found responsible for eutriphication of Kawar lake, Begusarai, Bihar. Same finding was observed by other author also [8]. Present investigation was carried out to study the pH, organic carbon, phosphate, calcium-magnesium, carbonate, bicarbonate, F_2 02 %, Al_2 03%, Sio_2 %, and conductivity of the soil of river Gandak, near Akharaghat during 2018-19.

MATERIAL AND METHODS

The area under both left and right embankments of river Gandak covers the soil of sandy loam, silty loam, sandy slit, loamy sand and sand. This area is not in form of toplography and level throughout and as such the distribution of salt content is not confirm and hence the concentration is high at the lower patches than that of the higher patches. In course of investigation during 2018 and 2019, data were collected on some important chemical parameters of the soil of river Gandak at five sites which has direct bearing on the aquatic flara and fauna.

RESULTS AND DISCUSSION

Data is recorded in Table -1.On the basis of data, different chemical parameters of soil were found as followings-

pH

Looking towards the obtained pH value the soil was slightly alkaline in reaction ranged from 7.2 and 7.8 in 2019 and possessed low to moderate salinity. The highest value (7.8) was in winter months of 2018 and 8.0 in the same months of 2019. During rainy season from July to September, it was measured 7.2 in both the years as the lowest value.

Organic Carbon

It was obtained in the range from 1.95% to 3.2% in 2018 and from 2.00 to 12% in 2019. The highest value was 3.12% and during April to June in both the years. From observed value it was obvious that these contents fell within the limit and covered the normal percentage in the soil.

Phosphate (P.O.)

Phosphate content of the soil varied from 2.4 to 6.3 ppm and from 2.2 ppm to 17 ppm in 2018 and 2019 respectively. In both the years, the lowest value was during winter and the highest value during rainy season showing the similar trends of fluctuation.

Calcium and Magnesium:

The Presence of Calcium and Magnesium component was very little. It was lowest during rainy season (8.00) and highest during summer (8.75) in 2018 showing same trend in 2019 as 7.60 and 8.50 respectively.

Carbonate

The carbonate content in the soil of this river could not be traced during investigation depicting its absence.

Biocarbonate

The value of bicarbonate varied from 4.80 (during summer) to 6.50 (during rainy season) in 2018 and 5.00 (during summer) to 6.40 (during rains) in 2019.

Iron and Aluminium Oxide (Fe_2O_3 and Al_2O_3)

The total iron and aluminium oxides were in the range from 16.20 (10.20 + 6.00) to 19.30 (12.50 + 6.80) in 2018 and from 16.30 (10.50 + 5.80) to 19.40 (12.80 + 6.60) in 2019. The highest value was during October to December and the lowest value during January to March.

Silica (SiO_2)

The Silica percentage from 50% to 60% in 2018 and from 52% to 61% in 2019 was within the required range for irrigation and aquaculture process leading into the prevention of alkalies into the soil.

Table-1:Chemical parameters of the soil of river Gandak near Akharaghat during 2018-2019 (Mean of sampling sites s_1, s_2, s_3, s_4 and s_5)

Constituents	Months				
		Jan. to March	April to May	June to Sept.	Oct. to Dec.
pH	2018	7.8	7.5	7.2	7.6
	2019	8.0	7.6	7.2	7.5
Organic Carbon%	2018	3.12	2.40	1.95	2.73
	2019	3.20	2.50	2.00	2.70
Phosphate ppm	2018	2.4	2.9	6.3	3.5
	2019	2.2	2.5	5.7	3.5
Ca+Magn. mili equi. per 100 gm soil	2018	8.20	8.75	8.00	8.50
	2019	8.00	8.50	7.60	8.20
Carbonate equi equi. per 100gm soil	2018	Nil	Nil	Nil	Nil
	2019				
Bicarbonate mili equi per 100 gm soil	2018	5.60	4.00	6.50	5.80
	2019	5.40	5.00	6.00	6.00
F_2O_2%	2018	11.80	10.20	10.55	12.50
	2019	12.00	10.30	10.60	12.80
Al_2O_3%	2018	5.50	6.00	7.50	12.50
	2019	5.20	5.80	7.20	6.60
SiO_2%	2018	50.00	53.00	60.00	52.00
	2019	52.00	54.00	61.00	55.00
Conductivity ml/mhos/cm	2018	1.065	0.630	0.310	0.360
	2019	1.070	0.610	0.300	0.280

Conductivity

The conductivity of the soil of river Gandak varied from 0.310 to 1.065 ml/mhos/cm in 2018 and from 0.300 to 1.070 ml/mhos/cm in 2019. It showed a decreasing trends from April to September and increasing trend from January to March in both years.

Soil conditions serve as more reliable index of productivity than water qualities [1]. Mitra indicated the necessity of determining the nutrient status of soil as a pre-requisite for profitable fish culture [4], pH value of the soil of river Gandak during present investigation was found of alkaline nature. Similar findings were observed from Burhi Gandak at Muzaffarpur by Thakur also [7]. Phosphate content above 1.0 mg was responsible for high productivity [6] silica oxide was recorded in the range from 50% to 60% in 2018 and from 52.0% to 61.0% in 2019. Other worker reported silica level in the soil of Gandak river ranging from 53% to 61% [3].

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