

Soil study of Pokhraiira pond of Samastipur: North Bihar

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ABSTRACT

Our investigations were done for two years from January 2014 to January 2016. The soil of Pokhraiira pond shows the average of sand as 12.8 ± 1.88 , silt as 25.83 ± 2.17 and clay as 61.75 ± 1.42 . It also exhibit similar pattern of ratio of sand, silt and clay throughout the observation period with a very little fluctuation. The average of nitrogen with 33.46 ± 5.7 and phosphorus with 26.81 ± 3.31 was recorded. The value of nitrogen as well as phosphorus was recorded maximum in May and minimum in December. The average value of Organic Carbon was recorded as 3.45 ± 1.01 which is the residual collection of all biotic activities of the ecosystem.

Keywords: *Soil quality, Analysis, Pokhraiira pond, Organic Carbon.*

INTRODUCTION

Soil texture is very important factor for determining its role in fish production of pond. Texture indicates the relative content of particles of various sizes, such as sand, silt and clay in soil. Texture influences the ease with which soil can be worked, the amount of water and air it holds, and the rate at which water can enter and move through soil. Soil with sand and silt particles in the pond provide favorable condition for better fish production.

Pokhraiira pond is a famous and oldest pond in Pokhraiira Village just south of the Burhi Gandak river in Samastipur district. It is about 12km north-west from Samastipur railway station. In order to determine the ecological condition of the Pokhraiira pond a survey was conducted on soil properties.

MATERIALS AND METHODS

Pokhraiira pond is a famous and oldest pond in Pokhraiira village just south of the Burhi Gandak river in Samastipur district. It is about 12km north-west from Samastipur Railway Station. Its dimension is about $100\text{m} \times 80\text{m}$ ($0.8\text{hectare} = 1.976\text{ acres}$) and depth varies between 1.5m-5m. ($1\text{hectare} = 10000\text{m}^2 = 107639.104\text{ ft}^2$ and $1\text{ acre} = 0.405\text{hectare}$ or $1\text{ hectare} = 2.47\text{acres}$). It contains water whole the year. In order to determine the soil quality of Pokhraiira pond four sites were chosen for research activity namely-1, 2, 3, and 4 as shown in the Fig. 1 and 2. These sites were choosen keeping in mind pollution point of view. The distance between two sites was 25-50m.

Soil samples were taken from the bed at the distance of 1.0-2.0 from the bank per month between 9-11a.m. for two years from January 2014 to January 2016. The soil analysis of Pokhraiira pond bed were made with references to sand, silt, clay, available Nitrogen,

Organic carbon *etc.* The Physico-chemical analysis of pond soil was done according to standard methods (APHA, 1985).



Fig.1: Satellite picture the Pond

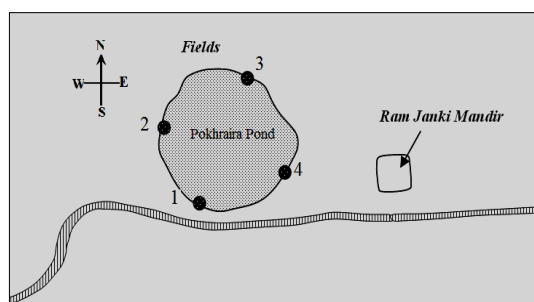


Fig.2: Selected sites at Pokhraira Pond

RESULTS AND DISCUSSION

Our investigations were done for two years. The soil of pond shows the average of sand as 12.8 ± 1.88 , silt as 25.83 ± 2.17 and clay as 61.75 ± 1.42 . It also exhibit similar pattern of ratio of sand, silt and clay throughout the observation period with a very little fluctuation. The average of nitrogen with 33.46 ± 5.7 and phosphorus with 26.81 ± 3.31 was recorded. The value of nitrogen as well as phosphorus was recorded maximum in May and minimum in December. The average value of organic carbon was recorded as 3.45 ± 1.01 which is the residual collection of all biotic activities of the ecosystem. Texture of soil is very significant for pisciculture. Observation made on the texture of soil is based upon the three factors i.e., sand, silt, and clay (Fig. 3). Continuous input, deposition, re-suspension, and re-deposition of particles in a pond result in a sorting of particles with the fine clay and organic matter particles setting in the deeper water and the coarser particles setting in shallower water. Deeper areas gradually fill in, and ponds may decrease in volume (Bharati, 1984).

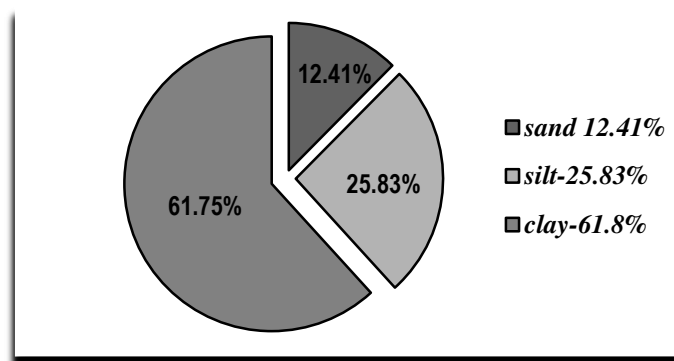


Fig.3. Composition of physical properties of pond soil

In the present context percentage value of sand, silt and clay determines so forth is not a good condition for fish production. The Fig. 3 also suggest to add sand and silt type of soil particle in the pond for maintaining balance among these particles for better fish production. According to Fisheries Department, Haryana (Requirements for pond construction) permissible parameter of soil and water soil are sand– 40%, Silt– 20%, Clay– 40%, organic carbon- 0.5-2.0%, available nitrogen(mg/100gm)-20-75, available phospho-rous (mg/100gm)- 210.

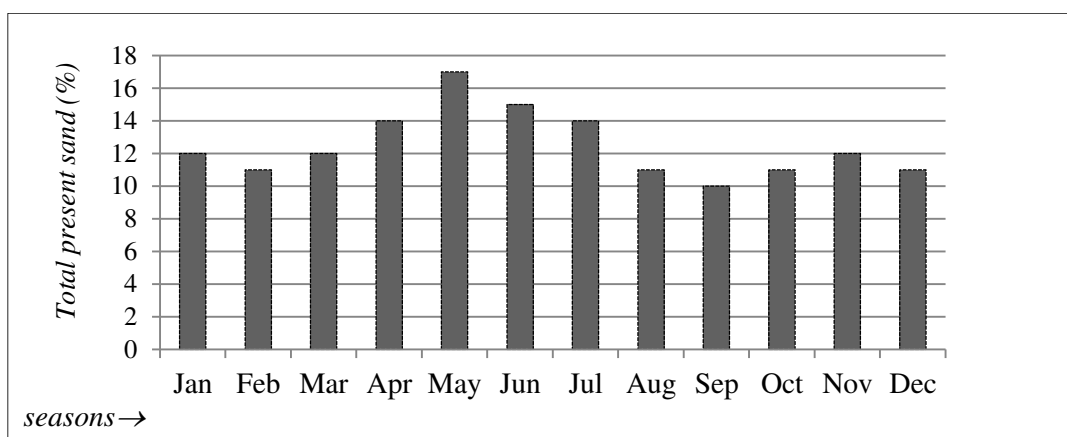


Fig.4: Sand Analysis

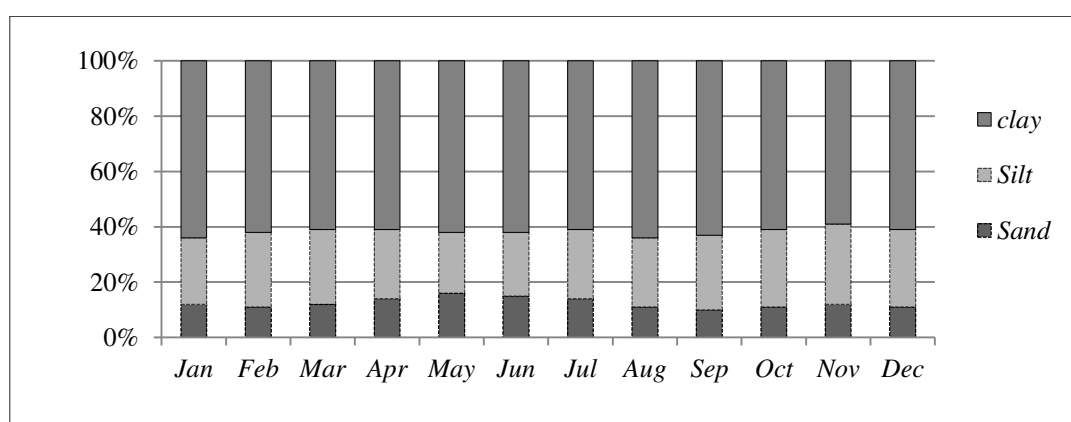


Fig.5: Analysis of Sand, Silt and Clay

Nitrogen in soil is present mostly in organic form, the fraction present as amino acids, pesticides, and easily decomposable protein is called available form of nitrogen, determining by decomposition with alkali permanganate. In the present study available nitrogen was noted as 33.46 ± 5.7 . The importance of soil phosphorus for increasing the aquatic productivity is well recognized. In the present study the average value of phosphorus was recorded as 26.81 ± 3.31 . Both the value of nitrogen as well as phosphorus was recorded maximum in May and minimum in December.

Except under high condition most of the inorganic phosphorus in the soil is bound up as insoluble $\text{Ca}_3(\text{PO}_4)_2$ and adsorbed phosphates on colloids. As both these forms are rendered soluble under an acidic and reducing condition of the soil, an acidic extracting $0.002\text{N} \cdot \text{H}_2\text{SO}_4$ has been used to determine available phosphate. In our investigation available phosphorus (P_2O_5) of soil shows remarkable high content. Above than $6\text{mg}/100\text{g}$ of phosphorus content is considered to be best for productivity of pond (Alikunhi, 1956). The average value of Organic Carbon was recorded as 3.45 ± 1.01 which is the residual collection of all biotic activities of the ecosystem. Compared to the mineral constituents of the soil, organic compounds are more varied and complex (Table 1 and Fig. 4,5).

According to Anand (2014) C/N ratio was an important factor in soil fertility as an indicator of the rate of decomposition of organic matter by heterotrophy. Close relationship existed between the organic matter and nitrogen content of soils and demonstrated that C/N

ratio of soils was fairly constant and also suggested that C/N ratio in soil organic matter was important as it created keen competition among microorganisms for available soil nitrogen when residues with high C/N ratio were added to soil. Low and high bacterial activity was observed at C/N ratios less than 10 and greater than 20 respectively.

The critical carbon to nitrogen ratio of freshwater aquaculture systems used to range between 20 and 25. It is low when the ratio falls below 10:1 and good when the ratio is 20:1 or higher. In the present study, annual average of Organic Carbon was observed as 3.45% as shown in Table 1. The average ration of C/N was noted with 10.46 ± 2.97 . The ratio of C/N was observed maximum 16.76 in March and minimum (6.57) in June.

Table1
Physico-chemical properties of Pond Soil

Months	Sand	Silt	Clay	Available Nitrogen (N)		Available P ₂ O ₅		Organic Carbon(C)	C/N Ratio
	(%)	(%)	(%)	(mg/100g)	(%)	(mg/100g)	(%)	(%)	-
Jan	12	24	64	29.8	0.298	24.7	0.247	3.9	13.08
Feb	11	27	62	32.0	0.320	27.1	0.271	4.2	13.12
Mar	12	27	61	35.2	0.352	28.6	0.286	5.9	16.76
Apr	14	25	61	37.1	0.371	29.1	0.291	4.5	12.13
May	16	22	62	45.8	0.458	33.2	0.332	3.4	7.42
Jun	15	23	62	35.0	0.350	28.6	0.286	2.3	6.57
Jul	14	25	61	40.1	0.401	30.8	0.308	2.8	6.98
Aug	11	25	64	28.4	0.284	25.1	0.251	2.8	9.85
Sep	10	27	63	27.9	0.256	25.0	0.250	2.7	10.55
Oct	11	28	61	34.2	0.342	24.1	0.241	2.9	8.48
Nov	12	29	59	30.4	0.304	23.4	0.234	3.1	10.19
Dec	11	28	61	25.6	0.279	22.1	0.221	2.9	10.39
Mean	12.41	25.83	61.75	33.46	0.3346	26.81	0.2681	3.45	10.46
S.D.	1.88	2.17	1.42	5.70	0.057	3.31	0.0331	1.01	2.97

CONCLUSION

On the basis of aforesaid discussion it may be concluded that the pond has available phosphorus (P₂O₅) is in remarkable high content. Above than 6mg/100g of phosphorus content is considered to be best for productivity of pond. It is also to suggest that sand and silt particle of soil should be added in the pond for maintaining balance for better fish production.

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