

## Study of Pond Bottom Soil of a Fish Culture Pond of Mohanpur, Samastipur, Bihar

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Received: 15.08.2020

Revised: 31.08.2020

Accepted: 26.09.2020

### **ABSTRACT**

During the limnological study of pond at Utkramit Vidyalaya, Mohanpur, Samastipur, Bihar, the soil of pond bottom has studied with reference to soil texture, available nitrogen available phosphorus and organic compound. It is found that ratio of sand, silt, and clay throughout the observation period with a very little fluctuation, whereas no significant mode of fluctuation observed in available nitrogen, whereas maximum amount of available phosphorus was found in the month of April and minimum in the month of December of the study period 2011-12. There was maximum ratio of organic carbon that was observed in the month of November and minimum in the month of March.

**Keywords:** *Soil texture, Nitrogen, Phosphorus, Organic carbon.*

### **INTRODUCTION**

Fresh water ecosystem are conveniently divided into two groups: Lentic and Lotic water bodies. Soil is one of the most important ecological factors contains a large number of different kinds of bacteria, plants and animals that compose interrelated biological complex. As a complex physical and biological system, it provides nutrients and oxygen for the organisms. The major physical and chemical features of soil are related to particle size, distribution, types of clay colloids, cation and anion change capacity, oxidation and reduction potential, soil reaction, electrical conductivity and nutrient dynamics. A healthy and judicious reduction condition should be maintained at the bottom to facilitate the optimum availability of nutrients as well as prevention of any unhealthy situation. On the whole soil plays an important role of fertility of fish life and water .....

The present study is concern of fish culture Utkramit Vidyalaya pond of Mohanpur, Samastipur with the study of soil bottom of the pond.

### **RESULTS AND DISCUSSION**

Soil of pond bottom was studied with reference to soil texture, available nitrogen, available phosphorus and organic carbon. Methods adopted for these analysis were given in Table 1.

#### **Soil Texture:**

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, sand, silt and clay in the 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. As depicted in the Table 1, the soil of pond showed annual average percentage of sand as 12.08+ 0.53, silt and clay throughout the observation period with a very little fluctuation.

**Available Nitrogen:**

Nitrogen in soil is presently mostly in organic form, the fraction present as amino-acids, peptides and easily decomposable proteins is called as available form of nitrogen, determining by decomposition with alkali- permanganate. In the present study available Nitrogen is noted between 21.4 and 45.8 mg/100g of soil. Annual average of nitrogen was noted as 32.40±1.86. Maximum value of Nitrogen was observed in the month of May and minimum in the month of March. However, there was no significant mode of fluctuation observed during the observation period.

**Available Phosphorous:**

The importance of soil phosphorus for increasing the aquatic productivity is well recognized. In the present study available phosphorus was noted in the range of .21.1 mg/100 of soil and 31.9 mg/100g of soil. Annual average of Phosphorus was ascertained as 25.94+ 1.06 mg/100 gm of soil. Maximum amount of available phosphorus was found in the month of April and minimum in the month of December.

**Organic Carbon:**

Organic Carbon is the residual collection of all biotic activities of the ecosystem. In the present study, annual average of Organic Carbon was observed as 3.19% as shown in the Table 1. It is also evident from the same table that its maximum percentage was observed in the month of 5.4 in May and minimum percentage in the month of 2.2 in the month of March Ratio of C/N also computed and given in the same table. It depicts that maximum ratio was observed in the month of November and minimum in the month of March. Physical and chemical properties of pond water are more or less a reflection of the properties of the bottom soil. In this respect the major chemical factors of importance are nitrogen, organic carbon, C/N ratio and phosphorus. In the present study, soil of pond at Utkramit Vidyalyaya, Samastipur was studied with reference to Soil Texture, available Nitrogen, available Phosphorus and Organic Carbon.

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 and presented in Table 1. Texture of soil is studied with the percentage ratio of sand, silt and clay. As depicted in the Table 1 the soil of pond showed dominance ratio of clay of soil. The annual average percentage of sand was observed as 12.08 ± 0.53, silt as 24.00 ± 0.86 and clay as 63.9±0.70. Subbaiah and Asija, 1956 reported that continuous input, deposition, resuspension and redeposition of particles in a pond result in a sorting of particles with the fine clay and organic matter particles settling in the deeper water and the coarser particles settling in shallower water. Deeper areas gradually fill in, and ponds may decrease in volume. Nitrogen in soil is present mostly in organic form, the fraction present as amino-acids peptides and easily decomposable proteins is called available form of nitrogen, determined by decomposition with alkali- permanganate. In the present study available Nitrogen is noted between 21.4 and 45.8 mg/100g of soil. Annual average of nitrogen was noted as 32.40 ± 1.86. Maximum value of Nitrogen was observed in the month of May and minimum in the month of March. However, there was no significant mode of fluctuation observed during the observation period. Table 1 also shows its presence in percentage. Average value of nitrogen in soil for a fertile pond is ranged from 50-60 mg/100g of soil. Here in this pond the value of nitrogen is far below than the standard (Al-Kahtani, 1956) and needs a special care for boosting of fish production.

The importance of soil phosphorus for increasing the aquatic productivity is well recognized. It is not the total quantity of phosphorous but its different forms and conditions control Hng their release to water phase that are important. Except under highly acid conditions most of the inorganic phosphorous 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 extractant 0.002  $\text{NH}_2\text{SO}_4$  (Barua and Ghani, 2012 and Alikunhi, 1956) has been used to determine available phosphate. In addition phosphorous is also present in organic form which is mineralized to soluble inorganic phosphate by bacteria. The process, however, may be impeded under acid conditions. In view of these, the available phosphorus and not total phosphorous has been considered more important in aquatic productivity.

**Table 1**  
**Physico-chemical properties of pond bottom soil of fish culture Utkramit Vidyalaya pond of Mohanpur, Samastipur, Bihar**

Months	Sand	Silt	Clay	Avilable Nitrogen		Available P		Organic Carbon	C/N Ratio
	(%)	(%)	(%)	(mg/100g)	(%)	(mg/100g)	(%)	(%)	(%)
Sept	10.00	28.00	62.00	30.00	0.300	24.00	0.240	2.4	8.00
Oct	12.00	22.00	66.00	32.40	0.324	23.00	0.230	2.4	7.41
Nov	11.00	25.00	64.00	31.90	0.319	21.20	0.212	2.5	3.33
Dec	12.00	28.00	60.00	30.00	0.300	21.10	0.211	2.5	8.33
Jan	11.00	29.00	60.00	29.20	0.292	25.40	0.254	2.7	9.25
Feb	15.00	23.00	62.00	29.10	0.291	26.30	0.263	2.8	9.62
Mar	12.00	22.00	66.00	21.40	0.211	27.20	0.272	2.2	10.28
Apr	13.00	21.00	66.00	41.60	0.416	31.90	0.319	3.6	8.65
May	16.00	20.00	64.00	45.80	0.458	31.60	0.316	5.4	11.79
Jun	12.00	22.00	66.00	37.30	0.373	30.10	0.301	2.8	7.51
July	10.00	23.00	67.00	31.50	0.315	25.20	0.252	4.3	13.65
Aug	11.00	25.00	64.00	28.60	0.286	24.30	0.243	3.3	11.54
Mean	12.08	24.00	63.92	32.40	0.320	25.94	0.260	3.13	9.65
S.E.	0.53	0.86	0.70	1.86	0.020	1.06	0.010	0.27	9.65

Ponds under study have been shown available phosphorous in between 20.1 31.9. units being expressed as mg of  $\text{P}_2\text{O}_5$  per 100g of soil. Thus the available phosphorous of soil shows a remarkable high content. Above than 6 mg/100g of phosphorous content is considered to be best for productivity of pond (Alikunhi, 1956; Walkley and Black, 1934; Barua and Ghani, 2012 and Munsiri *et al.*, 1995). Organic Carbon 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 (Ritvo *et al.*, 2002; Boyd *et al.*, 2005 and Nirmala *et al.*, 2005). According to Meehean (1935) bacterial activity depends not only on the carbon content but also on the ratio of C/N in the parent substance. 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 3.19% as shown in the Table 1. Ratio of C/N also computed and given in the same table. It depicts that maximum ratio was observed in the month of November and minimum in the month of March. Value of organic carbon in the present show good for pond and C/N ratio is also productive in nature.

**REFERENCE**

1. Al-Kahtani, K. H. 1956, Fish culture in India. *Bull. Ind. Cown. Agri. Res.*, 20:144.
2. Barua, P and Ghani, M. H. 2012, Comparative study of physico- chemical properties of soil. According to the age of aquaculture pond of Bangladesh *Mesopot J. Mar. Sci.*, 27(1): 29-38.
3. Boyd, C. E., Lim, Queiroz, J and Salie, K. 2005. Best management practices for responsible aquaculture, 1-47. [http:// pdf. Usaid. Gov](http://pdf.usaid.gov)
4. Munisiri, P., Boyd, C. E., Teichert- coddington, D. and Hajak, B. F. 1996. Texture and chemical composition of soils from Shrimp ponds near Choluteca, Honduras, *Aquac. Int.*, 4(2): 157-168.
5. Nirmala, K., Yuniar, E. and Budiarti, T. 2005. Productivity and chemical parameters in the bottom soil of 1 & 3 years operated pond of Black Tiger Prawan *Penaeus monodon* Fab. Culture. *J. Akwakultur Indones*, 4(1): 63-67.
6. Ritvo, G., Shitumbanuma, V. and Samocha, T. M. 2002. Changes in the concentration of nutrients and other chemical properties of shrimp pond soils as a function of pond use. *J. World. Aquac. Soc.*, 33(3): 233-243.
7. Subbaiah , B. V. and Asija, G. L. 1956. A rapid procedure for the estimation of available nitrogen in soil. *Curr. Sci.*, 25: 259.
8. Walkley, A and Black, I. A. 1934. An examination of Degtiareff method for determining soil organic matter and a proposed modification of the chromic acid titration method. *Soil. Sci*, 37: 29-37.