STUDY OF PHYSICO-CHEMICAL PARAMETERS OF SOIL OF HAZARIBAG LAKE

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ABSTRACT

The soil of any water body is very important for its productivity. It is the reservoir of organic matter and is a continuous source of fertility of water bodies. Aquaculture depends on the quality and Chemistry of the soil of such aquatic body. In this study physico-chemical conditions of the bottom soil of Hazaribag Lake such as PH, Organic carbon, carbonate, bicarbonate and phosphate (as P2O5) have been recorded.

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INTRODUCTION

The soil is a complex physical and biological system providing support to water nutrient and oxygen for plant. It also plays an important role in determining the fertility of water bodies. Its constituents have a direct relationship with the growth of aquatic plants as well as organisms as soil fertility induces a good growth of benthic fauna under favourable physico-chemical conditions of bottom soil. The soil condition serves as more reliable index of productivity of any water body. The determination of the nutrient status of soil is a prerequisite for profitable fish culture.

MATERIALS AND METHODS

01. CONCENTRATION OF HYDROGEN ION (pH)

For determination of pH of soil, a sample of 20 mg was taken and mixed with 50 ml of distilled water. The solution was left to settle for half an hour. The pH was recorded by glass electrode of pH meter in the laboratory.

02. ORGANIC CARBON

Organic carbon was estimated by Walkley and Black's method (1934).

Following reagent was used:-
a)   Potassium dichromate (1 N)

b)   Ferrous Ammonium sulphate solution (1 N)

c)   Phosphoric acid (85%)

d)   Diphenylamine solution.

One gram of the soil sample was taken. It was sieved through 0.2 mm sieve. Then this sample soil was kept into a 500 ml conical flask. 10 ml of potassium dichromate solution and 20 ml of concentrated sulphuric acid were added. The flask was then shaken and kept for half an hour. After that 20 ml of distilled water, 10 ml phosphoric acid and 1ml of Diphenylamine were added one by one. The contents of the flask attained a dark blue colour. The solution

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was then titrated against ferrous ammonium sulphate solution, adding drop by drop till the colour suddenly changed to green. From the titrated value, the percentage of organic carbon present in the soil was calculated in the following manner.

$$\frac{V1 - V2}{W} \times 0.003 \times 100$$

Where,
V1 = ml of 1 N potassium dichromate (10.5 ml)
V2 = ml of 1 N Ferrous ammonium sulphate.
W = Weight of the soil.

03. ESTIMATION OF CALCIUM AND MAGNESIUM
The Calcium and magnesium was estimated by ethylene diamine Tetra Acetate (E.D.T.A) method. Reagent Required:-

a)   Standard Calcium Chloride solution (0.01N)
b)   Hydrochloric acid (3N)
c)   Ethylene diamine tetra acetate (0.01 N)

25 ml. of sample was taken out by a pipette and put in a conical flask and 3 or 4 drops of erichrome black –T- Indicator were added one by one.

This solution was then titrated with EDTA solution. The colour of the solution changed from red to blue. Care was taken to see that nothing of wine red colour remained at the end point. The percentage of calcium and magnesium was calculated.

04. ESTIMATION OF CARBONATE AND BICARBONATE
For the estimation of carbonate and bicarbonate following reagents were used:

A).   N/ 10 Hydrochloric acid
B).   Phenolphthalein indicator

50 ml of clean solution of soil was taken out in a pipette and put into a conical flask and one or two drops of phenolphthalein was added. The solution did not show any colour, so there was no carbonate in the soil. To the same solution 2-3 drops of methyl orange indicator were added and the titration with 0.1N, HCl was continuing till the indicator changed into light red colour. Calculation of the Bicarbonate percentage in the soil was done as:-

M.EQ. CO3 = V1/2
M.EQ. HCO3 = V2-V1/2
Where,

V1 stands for volume in ml of N/10 acid used to neutralize 100 ml of the sol to the phenolphthalein end point.

V2 stands for the additional amount of N/10 acid to reach methyl yellow end point.

0.5 DETERMINATION OF AVAILABLE PHOSPHOROUS (P2O5) BY OLSEN'S METHOD (1957):-

Following reagents are used in this method:-

1.   Olsen's reagents: – 356 gm. of sodium bicarbonate were taken and then it was dissolved in 770 ml of distilled water. In this solution 30 ml of sodium hydroxide (20%) were added to adjust the pH and diluted the solution up to 8000 ml with distilled water.

2.   Ammonium Molybdate (Hcl solution):- 15 gm of ammonium molybdate were dissolved in 200 ml of distilled water at about 60 0 c. The solution was cooled, filtered and 350 ml. of 10/N and 50 ml. conc. HCL were added. This solution was made up to one liter by distilled water.

3.   Drago-G-60- Carbon (Phosphate Charcoal):- As Drago –G-60- Carbon was not available so in place of it activated Charcoal was used.

4.   Stannous chloride (50%) : - 10 gm of stannous chloride were dissolved in 25 ml. of conc. HCl in order to avoid the contact from the atmosphere. 20 ml. of kerosene oil were added. The solution was taken in 'U' – shaped glass tube. 1 ml. of this stannous chloride solution was diluted with 66 ml. of distilled water and was used for developing color.

5.   Standard Solution: - Potassium dihydrogen phosphate was kept at 400 c for an hour and the 0.4390 gm of it was dissolved in one liter of distilled water after adding a few drops of 7 N sulphuric acid. Now this solution had 110 ml ppm phosphorous. From the above solution 5 ml. were taken and dilute to 250 ml. This will contain 2 ppm of phosphorus from 2 ppm solution the following standards was taken :-

1 ml = 2/25 ppm	2 ml = 4/25 ppm
3 ml =6/25 ppm	4 ml = 8/25 ppm
5 ml = 10/25 ppm	6 ml =12/25 ppm

In a flask of the capacity of 250 ml of Ammonium Molybdate, the above stands were taken, and 1 ml of dilute stannous chloride solution was added and this solution was made up to 25 ml with distilled water. The intensity of the colour developed after 10 minutes,

was measured using red filter in the colorimeter .a standard curve was plotted from the reading.

Procedure:-
2.3 gm of soil water taken 0.5 gm activated charcoal was added to it. Net 50 ml Olsen's reagent was added and the whole things were shaker in mechanical shaker for half an hour. Then it was passed through a filter paper and filtrate was collected in a small 30 ml. brown bottle. 2.5 ml of the above solution were taken

in a 25 ml measured flask. The 2.5 ml of reagent, i.e. Ammonium mollybdate was added 0.5 ml of distilled water was added to take the value 10 ml the 0.5 ml of stannous chloride (SnCl2) was added followed by 2 ml of diction water to make the value 12.5 ml after the addition of stannous chloride and blue coloration appears after 10 minutes. 5 ml of this solution was kept in colorimeter. Intensity of the colour was read in colorimeter using a red filter.

RESULT AND DISSCUSSION

TABLE: SOIL ANALYSIS OF HAZARIBAG LAKE.

Sl. No.	SOIL CONSTITUENTS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1.	pH	8.01	8.00	7.00	7.80	8.20	8.10	8.40	7.30	7.70	7.20	7.40	8.20
2.	ORGANIC CARBON. (%)	1.55	1.43	1.38	1.68	1.60	1.55	1.53	1.80	1.85	1.89	1.89	2.04
3.	PHOSPHATE (P2O5) (PPM)	48.00	48.00	41.50	41.60	38.20	37.00	37.10	37.20	38.00	49.20	55.00	56.00
4.	CALCIUM & MAGNESIUM (M.EQ/100gm)	8.55	9.00	10.15	0.25	3.00	4.10	8.02	1.95	0.98	2.61	3.95	6.95
5.	CARBONATE (M.EQ/100gm)	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
6.	BICARBONATE (M.EQ/100gm)	1.00	2.00	2.00	3.00	4.00	5.00	5.00	1.50	1.00	3.50	2.50	2.00

M.EQ. -Mill equivalence/100gm

The PH of the soil of Hazaribag Lake varied from 7.20 to 8.40. The minimum PH was recorded in the month of October and maximum PH value was recorded in the month of July. Its organic carbon varied from 1.38 to 2.04. In the soil of Hazaribag Lake Carbonate was untraceable because as soon as carbonate was formed it might have transformed into some kind of bicarbonate, which was found in good amount in this soil. Its phosphate content varied from 37.10 to 56.00'

CONCLUSION
Soil plays an important role in determining the fertility of a water body. It influences water quality and various production process. The soil condition of Hazaribag lake can be put under the category of 'suitable' for fish culture when compared to the classification of pond productivity given by Banerjee (1967).

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