

# Study of Seasonal Variations in Soil with some Physio-Chemical Parameters of Tilyar Lake, Rohtak, Haryana

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## ABSTRACT

The present study was conducted in order to demonstrate the physico-chemical parameters of Lake Tilyar in the pre and post monsoon seasons. On the basis of lake morphology, lake was divided in to five sampling stations. Soil samples were collected fortnightly from each sampling station and analyzed for estimation of pH, Electric Conductivity (EC), Total organic carbon (TOC), Phosphate (PO<sub>4</sub><sup>3-</sup>), Nitrate (NO<sub>3</sub><sup>-</sup>) for sediment samples. The present study is aimed at observing, comparing and analyzing values of various physico-chemical parameters of soil samples.

## 1. Introduction

Before going into the study, we need to know what are sediments ? Sediments are that soil materials which accumulate at the base of water and create a layer of solid particles like clay, soil etc. The soil particle including sand, clay, silt and others which settle at the bottom of a water body is called sediment. Sediment is any particulate matter that can be transported by fluid flow and which eventually is deposited as a layer of solid particles on the bed or bottom of a body of water or other liquid. Suspended materials in natural water are often referred as seston. This is composed of both inorganic and organic material as well as living organism. Sediments of the littoral zone of lakes and running water are stored along a gradient by particle size as a result of water movements and difference in water velocity. The lake serves several purposes.

Pollution in lake has increased manifold in the last half of the 20<sup>th</sup> century and due to following reasons many lakes have even vanished:

- I. Industrialization
- II. Increase in population
- III. Use of chemicals in agriculture
- IV. Deforestation
- V. Housing and infrastructural projects and development

Soil quality demonstrates the current status of the concentration of the various solutes at a given area and time. Soil quality parameters provide information about the suitability of soil for its various uses and for the betterment of the existing conditions. Soil quality programmes provide the current information which is required for the development and management of its beneficial uses. A regular monitoring of soil quality is required for the determination of extent of pollution in lakes. Present study was designed to assess the seasonal variations if any, in physico-chemical soil quality parameters and if so whether or not they are within desirable limits.

### Study Area:

The study area is confined to Tilyar Lake situated within the jurisdiction of District Rohtak, Haryana and its basic

information is shown as under in Table A. The lake has spread over an area of about 132 acre. The lake is stagnant and it has huge flora in the form of trees, jungles with bushes around it which is reflected in Fig-1. It is amongst the important tourist complexes in Haryana, came in to existence in 1976 for the public recreational use.

TABLE A: Basic information about Tilyar lake

Location	Rohtak, Haryana, India
Latitude	76°637' east
Longitude	28° 882' west
Total area	18-20 acres
Max. Depth	10-12 feet
Primary inflows	Canal water

## 2. Materials and methods

### Collection and Storage of Soil Samples

Five sampling spots were selected for the purpose of collection of samples. The sampling spots were selected on the basis of lake morphology. Soil samples were collected in polyethylene bags or tubs for analysis. The solutions were prepared in distilled water. The pH meter (EUTECH 35624-02 pH meter) was put into use for to evaluate the pH of soil sample. The conductance of soil samples was measured with the help of conducto-meter (EUTECH ECCON 603K conductivity meter). The organic carbon was estimated by modified Walkley Black Method (Walkley and Black 1943). Phosphate of soil samples was determined spectrophotometrically using Ammonium molybdate and stannous chloride method.

## 3. Results

The values of physicochemical parameters of the soil samples collected from the lake were taken down and they are shown in Table 1 and represented in graphs (Figures 1 to 5).

The minimum value of pH (7.9) was observed in the post monsoon at station-1 while maximum value (9.9) in the pre

monsoon station-4. Highest concentration of EC was seen in pre monsoon (0.393mS/CM) at station 3 in comparison to post monsoon at station 1 where lowest concentration of EC was recorded i.e. 0.225mS/CM.

The maximum concentration of nitrates (134.2 ppm) was observed in the pre monsoon at station-1 while minimum concentration (120.3 ppm) in the post monsoon at station-2. The maximum concentration of phosphates (0.686 ppm) was observed in the pre monsoon at station-4 while minimum concentration (0.604 ppm) in the post monsoon at station-1.

**Table 1: Seasonal variations in physico-chemical parameters of Tilyar Lake soil samples**

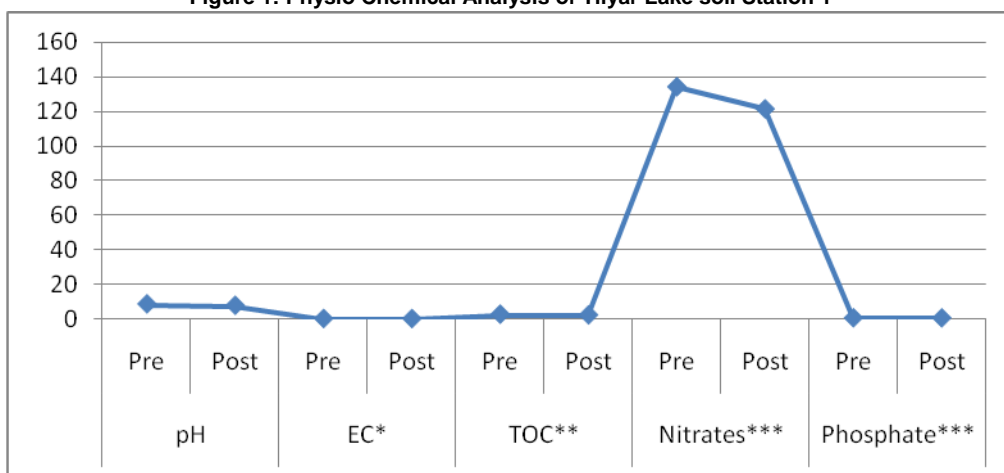
S.No	pH		EC*		TOC**		Nitrates***		Phosphate***	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
TS1	8.7	7.9	0.263	0.225	2.77	2.37	134.2	121.4	0.661	0.604
TS2	9.1	8.7	0.247	0.271	2.77	1.53	130.1	120.3	0.646	0.61
TS3	9.6	8.9	0.393	0.281	1.57	1.42	129.2	125.3	0.676	0.608
TS4	9.9	8.5	0.292	0.249	2.44	1.98	127.3	128.4	0.686	0.662
TS5	9.5	8.6	0.278	0.267	2.56	1.87	128.6	121.3	0.634	0.606

\* Units are in mS/cm

\*\* Units are in %

\*\*\*Units are in ppm

**Figure 1: Physio Chemical Analysis of Tilyar Lake soil Station 1**



**Figure 2: Physio -Chemical Analysis of Tilyar Lake soil Station 2**

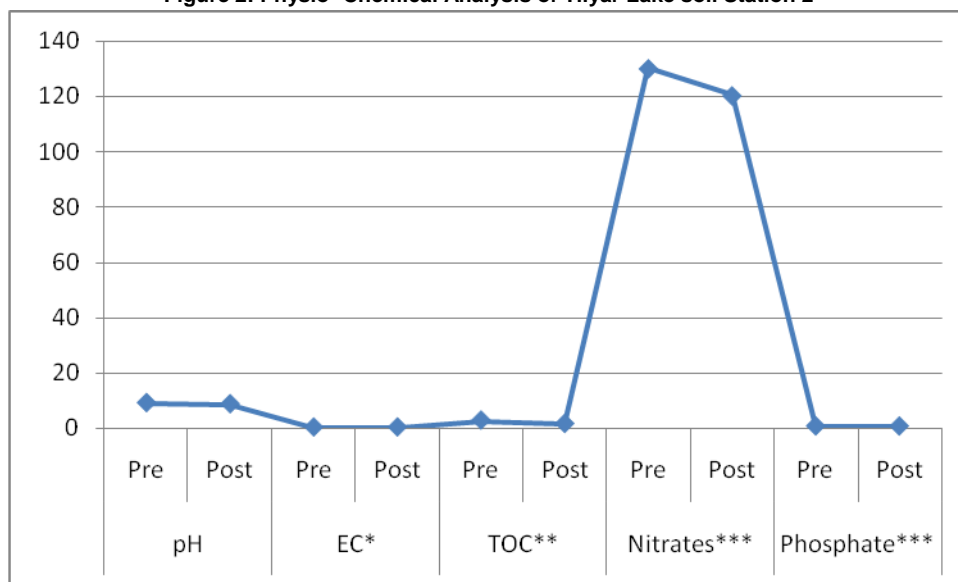


Figure 3: Physio Chemical Analysis of Tilyar Lake soil Station 3

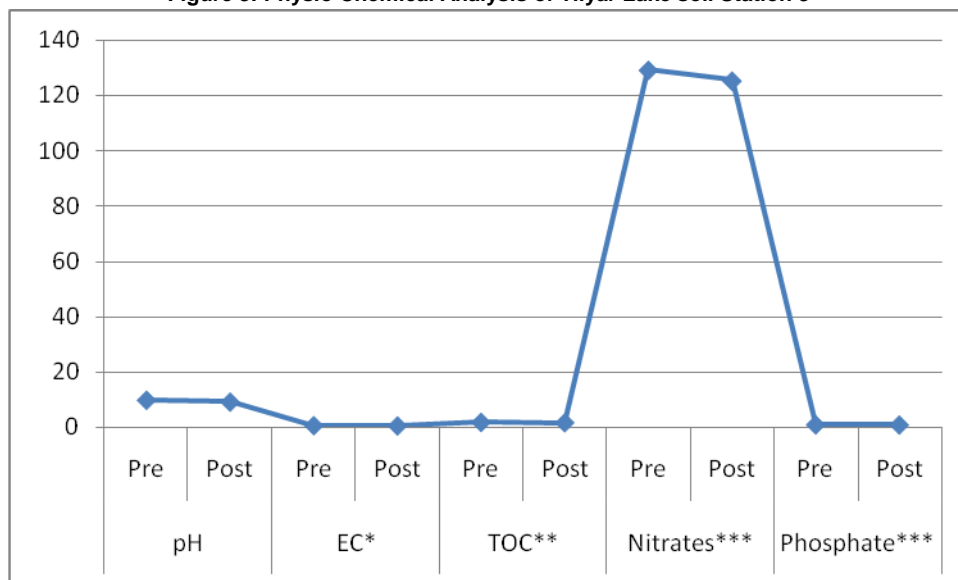


Figure 4: Physio Chemical Analysis of Tilyar Lake soil Station 4

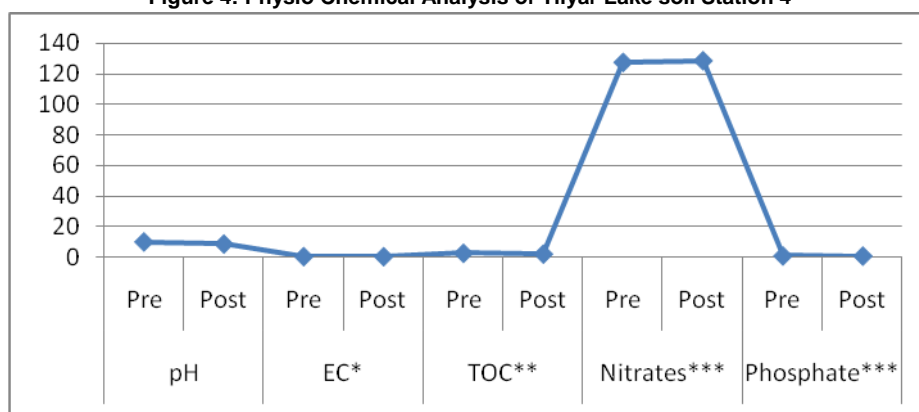
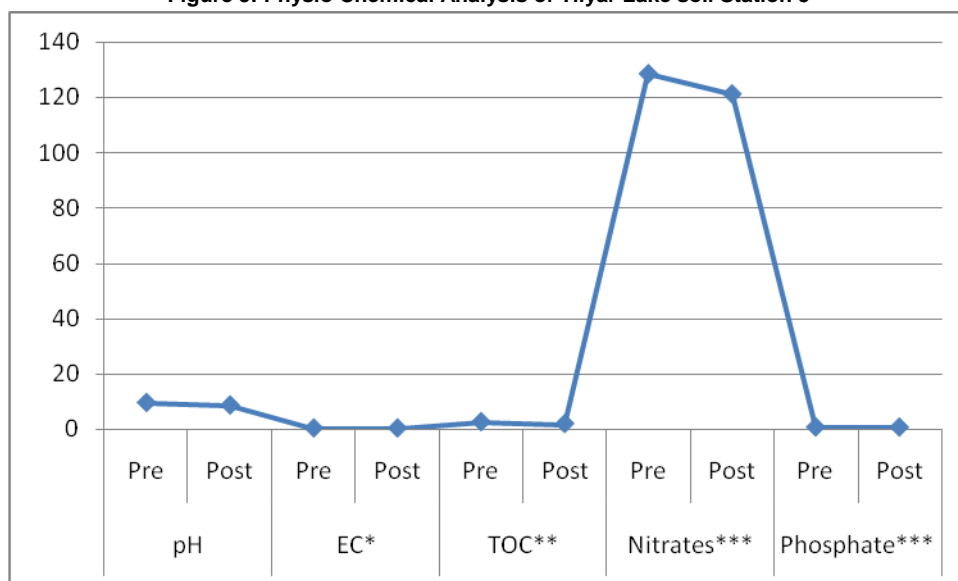


Figure 5: Physio Chemical Analysis of Tilyar Lake soil Station 5



4. Discussion

Increasing pollution and contamination due to rapidly growing industrialization, exponential population growth, urbanization, modern agricultural activities and other

anthropogenic activities, the World's precious soil resources are in violent situation at present. pH measures the intensity of acidity and alkalinity of the sediment suspension and provides a good identification of chemical nature of sediment. pH of sediments was found low in post monsoon season. This may

be due to the addition of organic matter which reduces the pH which are augmented by microbial methane fermentation and nitrification of ammonia (Wetzel, 1983). EC of sediments was found high in pre monsoon season in comparison to post monsoon season. Organic carbon is an index of soil productivity. It reflects as to what amount of carbon broken down from plants and animals is stored in soil. Organic carbon not only influences various physico-chemical properties of bottom sediments releasing different nutrients to more available from in aquatic environment but also controls the oxidation reaction - an important property of reservoir ecosystem (Ojha et al., 2007). In Tilyar Lake, high percentage of organic carbon in pre monsoon season than post monsoon. This may be due to flushing out of dissolved organic matter and high decomposition rate in post monsoon because of high temperature and moisture content.

Phosphorous is the key nutrient of plant and plays a vital role in a living organism. A large number of enzymatic reactions depend on phosphorylation which is required by all organisms. Phosphate is responsible for the regulation of primary productivity of aquatic ecosystem. No significant change in phosphate concentration was found in Tilyar lake during pre as well as post monsoon. Nitrogen in the sediment is present mostly in the organic form together with small amount of ammonia and nitrate form. The plants root take up nitrogen in the form of  $\text{NO}_3^-$ ,  $\text{NH}_4^+$ . Seasonal variations show that maximum content of nitrate during pre monsoon season in lake may be due to presence of less amount of water in lake and also due to decomposition of organic matter releasing nitrogen substance. Nitrate concentrations were higher in sediment than water.

Denitrification rates of sediments are three to four orders of magnitude greater than those of the overlying water. Denitrification activity within sediment involved to the reducing condition (James, 1979). In sediment of the littoral zone,

denitrifying activity is depressed at the sediments surface and increases at sediments depth (10-15 mm) where reducing condition increases. As the overlying water become anoxic and reducing increased denitrifying activity occurs at the sediment water interface (Wetzel, 1983). High amount of aquatic weed and algal bloom spread over the lake area. So, the nitrate concentration are decreased because luxuriant uptake by aquatic weed. Phosphorous released from sediments increase eutrophication. An increase in pH can be a reason of shift from non toxic ammonium ion to toxic ammonia. Increased eutrophication may result in killing of fishes due to high photosynthetic rates and total ammonium concentration.

Increased pH causes a shift from non-toxic ammonium ion to toxic ammonia. Seasonal variations show that maximum content of all parameters during pre monsoon season may be due to presence of less amount of water in lake and also due to release of nitrogen on accounts of organic matter getting decomposed. Due to high pH, EC, TOC, Nitrates and Phosphates indicates that Tilyar Lake may be considered as rich in nutrients and having subsequently high levels of biomass. Hence, there is every likelihood of excessive richness of nutrients in the lake water in near future. It is further recommended that the authorities should regularly monitor for physico-chemical assessment for seasonal variations and prevent every possible source of pollution around the lake.

## 5. Conclusion

The Physico- Chemical Analysis of the water samples from the five sampling sites revealed that the water of Tilyar Lake is eutrophic. It is further recommended that the authorities should regularly monitor for physico-chemical assessment for seasonal variations and prevent every possible source of pollution near and all around the lake.

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