

Assessment of Physico-Chemical Properties of Water and Soil Nutrients at Bathi Lake

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Abstract - The present study was carried at Bathi Lake Davanagere to check the physical and chemical properties and its effect on the lake. They include P^H, Electrical Conductivity, Turbidity, Total Hardness, Calcium, Magnesium, Chloride, Total dissolved solids. There is a growing public concern over the potential accumulation of heavy metals in agricultural soils potential accumulation of heavy metals in agricultural soils. Excessive accumulation of heavy metals in agricultural soils may not only result in environmental pollution may also affect the food quality and safety. The present paper deals with accumulation of heavy metals in soil around the Bathi Lake of Davanagere city, Karnataka. The physical chemical characters such as P^H, Electrical Conductivity, Organic Carbon, Nitrogen, Phosphorous and Potassium were analyzed.

Key Words: Total Dissolved Solids, Electrical Conductivity,

Sodium Adsorption Ratio

1. INTRODUCTION

Water is the most important element in shaping the soil and climate. It is one of the most important compounds which have profound effect on life. Groundwater is used worldwide for residential, commercial and irrigation water supply etc. In the last few decades, there has been a tremendous increase in the demand of fresh water due to rapid population growth and the accelerated pace of industrialization there has been tremendous increase in demand for fresh water in the last few decades. According to WHO organization, water is responsible for about 80 percent of all the human disease. When the groundwater is polluted, it is difficult to quickly recover its consistency and to devise ways and means of preserving it.

Most of the soluble constituents in ground water originate from soluble minerals in soil and sedimentary rocks. Calcium, sodium, bicarbonate and other sulphate ions are the most common soluble constituents. Chlorine ion derived from intruded sea water known as connate water is another component. Nitrate can be a natural component but high concentrations often suggest a source of pollution. Water quality standards are needed to determine the stability of ground water of a certain quality for its intended use. Quality is generally

represented by classes of relative suitability for drinking water, although most classification systems include on basic conductivity, sodium content and concentrations of boron.

Soil is an invaluable resource but their multipurpose and long-term exploitation has significant implications for a specific region's overall ecology. Inappropriate agricultural practices, grassland overgrazing and indiscriminate deforestation cause soil erosion, decrease in soil fertility, productivity and soil quality in addition to environmental hazards.

1.1. Study Area:

Bathi Lake is a small irrigation tank located between 14°28'27" N latitude and 75°52'13" E longitude. It lies at an elevation of 598 meters above mean sea level (MSL) in Davanagere Taluk of Davanagere District in Karnataka, India. This lake is situated adjacent to Harihar-Davanagere state highway road. This wetland provides water for fishing activities or aquaculture practice as well as irrigation to surrounding agricultural lands of Doddabathi village. The lake is located at 7 km distance from Davanagere from Harihar.

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Main portion of the lake is covered with red sandy soil and black soil. Red sandy soil is scattered across the expectation of the Doddabathi in a region in the northern part where black soil covered the ground. The red sandy soil consists of red loams, red sandy, sandy loams and typically black soil.

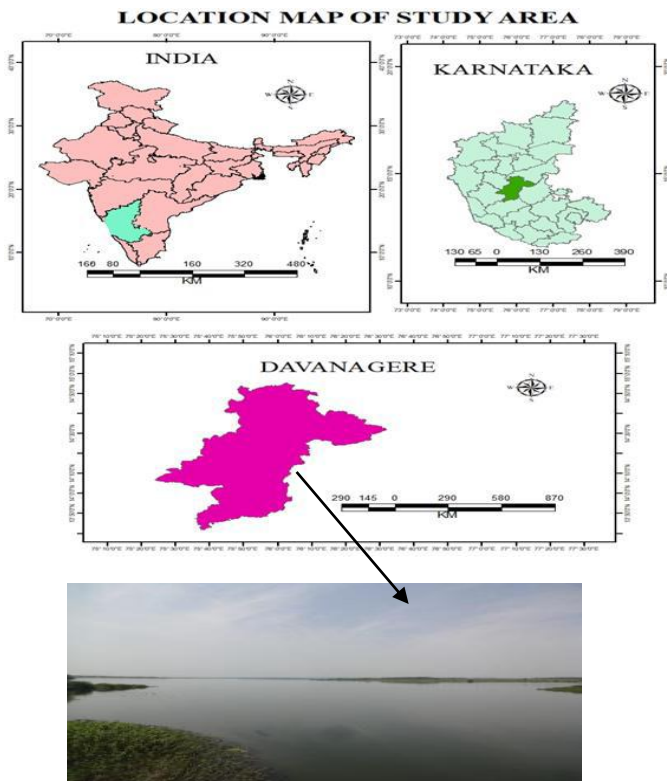


Figure 1: Location of Bathi Lake

- Use organic manure to the agricultural field.
- Don't destroy the forest.
- Control the flow of water on the surface of earth.

Devendra Dohare et. al., (2014), made analysis of ground water quality parameters. Water is polluted due to increase in population, discharge of sewage into the water, entry of dissolved chemicals into the water etc. this kind of water is harmful to human beings. Hence sample of polluted water are collected and tested in the laboratory, to give proper treatment to the water. The tests conducted are pH, acidity, alkalinity, total hardness, total dissolved salts, suspended solids etc.

S P Gorde et. al., (2013), carried water quality parameters on lake. As the population increases people require large amount of water. But the water is available on the earth small quantity. Hence waste water which is discharge into the lakes, rivers etc are treated properly to full fill the requirement of water to the public. Hence the sewage water samples which are collected from different industries and water quality parameters are tested in the laboratory, to make the water pure and safe for drinking.

Mehjin A M AL-Ani et. al., (2019), this study was conducted to determine effect of pesticides on soil microorganisms. As the population increases day by day in the study area, large amount of pesticides are used for better yield of crops. If pesticides are continuously used in the agricultural field the ill be a decrease in the soil fertility and decrease in the micro organisms count and activities. They conclude that the continuous use of pesticides in the agricultural field soil become more poisons and it decreases the incubation period of micro-organisms and large amount of death of bacteria will take place which are most important bacteria and they are very useful for better yield of crops.

2. METHODOLOGY

2.1. Location of Sampling

Sampling of the present study grab is picked. The sampling is conducted at a given time and place. This represents a snapshot of a sampling area in both space and time. Grab sampling is picked at a given spot, depth and time.

The water samples of lake and bore wells were collected in polythene bottles, but for the measurement of dissolved oxygen (DO) the sample (300ml) was fixed separately in BOD bottle at spot by using Winkler's agents, and for the water samples were immediately brought into laboratory for the remaining experiments to measure various physico-chemical parameters such as water temperature and pH were recorded at the time of sample collection by using thermometer and packet digital pH meter. While the other parameters such as DO, TDS, Hardness, EC, Alkalinity, Chlorides and various

1.2 Literature Review

Arivili Appavu et. al., (2016), carried study of water quality parameters of Cauvery river water in Erode region. The people living in the downstream are using the water for irrigation, drinking and other domestic activities, four samples were collected from polluted sites, know water quality. As per standard methods, physic-chemical parameter tested for collected samples and tested values compared with standard readings (BIS standards). The tested values shows high pH which indicates the water is acidic in nature, and a dissolved solid present in large quantities which result in acute myocardial infarction as well as ischemic heart diseases. Hence Erode region Cauvery River requires proper treatment.

Dr. Rajesh et. al., (2015), made a study on soil pollution. In this paper they mentioned that what are the causes, effects, and how to control the soil pollution. Soil pollution means contamination of soil due to various activities of human beings. Soil pollution is due to application of chemical fertilizers and pesticides to the soil for better yield of crops, these are the main cause of the soil pollution. The effects of soil pollution are it reduces the soil fertility and crops cannot give better yield in that soil.

Controls of soil pollution are

- Control the usage of plastic bags, and try to recycle the plastic.

heavy metals were measured in the laboratory by using Indian standard procedures (Titration process, Atomic Absorption Spectrophotometer (AAS) and flame photometer)

The soil samples were obtained from 7 different location by core cutter method at Bathi Lake Davanagere. The soil samples are analyzed in the laboratory to know the nutrient status of soil. Soil nutrients like macro nutrients and the physio-chemical parameters are also be analyzed.



Figure 2: Image showing the collection of water samples

2.2. Surface Water Quality

Surface water levels drop as a consequence of evaporation as well as water flowing through the ground becoming groundwater. In addition to being used for drinking water, surface water is also used for irrigation, treatment of wastewater, livestock, agricultural use, hydropower, and recreation. The Environmental Protection Agency (EPA), estimates that about 68 percent of water supplied to communities comes from surface water. For USGS water use data, surface water is considered freshwater if it contains less than 1000 milligrams of dissolved solids per liter (m/L).

2.2.1 Reservoir Water Quality

The water samples from the respective lake i.e., Bathi Lake has been collected for the present study at different depths of 0m, 2m and 6m. Here the results of surface water quality of Bathi Lake.

Table 1: Represent the result of Reservoir Water Quality

Parameter	0m	2m	6m	Permissible Limit
Acidity (mg/l)	48	45	43	0
Alkalinity (mg/l)	498	476	470	200-600
Total Hardness (mg/l)	136	125	117	300-600
Calcium (mg/l)	46.40	45.3	43.7	200
Magnesium (mg/l)	5.56	4.73	4.7	100
Chlorides (mg/l)	82.97	80.73	79.4	1000
pH	9.15	9.10	8.7	6.5-8.5
EC (ds/m)	0.60	0.57	0.54	0-3
TDS(ppm)	153.5	149.6	147.4	2000
Turbidity (ppm)	6.78	6.7	6.1	5 to 10
Sulphate (mg/l)	36	33	30	400
Carbonates(me/l)	0	0	0	0.06-0.12
Bicarbonates (me/l)	5.3	5.1	4.47	0.7-11.3
Sodium (me/l)	5.17	5.15	5.1	200
SAR(√millimole/l)	4.78	4.7	4.5	<10
RSC (me/l)	0.95	0.88	0.83	<1.5



Figure 3: Image showing the collection of water samples

Soil testing is the only way to assess the appropriate nutrient level, and the only way to establish precise recommendations for fertilizers. The soil properties prone to changes can be used as measures to improve enhance the consistency of the soil. Soil analysis is conducted for the study of various parameters such as total organic carbon, Free Nitrogen (N), Phosphorous

(P₂O₅) and Potassium (K₂O), p^H, Electrical Conductivity, soil texture, bulk density, chloride, fluoride and percent humidity. Soil fertility depends on the concentration of N, P, K, physico-chemical properties such as moisture content, Nitrogen, phosphorous and organic matter required for plant production. Potassium is used for flowering purposes, it is also important for protein building, photosynthesis, fruit quality and disease

reduction and phosphate is used for growth of roots in plants.

2.3 Physico chemical parameters of soil

Physiochemical parameters of soil like p^H, Electrical conductivity, Moisture content, Dry density and Bulk density are analyzed in the laboratory to know the characteristics of collected sample.

Table 2: Gives the results obtained for physio-chemical parameters of soil.

Parameters	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6	Core 7
p ^H	8.36	8.02	8	8.45	8.1	7.79	8.17
EC (ds/m)	0.25	0.99	0.14	0.1	0.37	2.9	0.47
Water content (%)	3.945	32.53	3.14	3.55	12.65	35.97	15.53
Bulk density (gm/cm ³)	2	1.831	1.598	1.686	1.749	1.547	2.15
Dry density (gm/cm ³)	1.92	1.381	1.549	1.628	1.552	1.137	1.86
Organic matter (%)	2.15	1.88	0.941	0.268	0.672	4.639	1.075
Organic carbon (%)	1.248	1.92	0.546	0.156	0.39	2.691	0.624

2.4 Nutrient Status

The quality of the soils depends on the variability in the environment the type of soil depends on the form of humus type, and size of the rock grains that produce clay soil, muddy soil, sand etc. The benefits provided by the soil promote the ecosystem by promoting plant growth, controlling speed, water purity, recycling nutrients, using dead animals, plants as substrates, helping to improve the atmosphere, space for recycling. Soil fertility is of utmost importance in enriching plant growth by providing NPK, minerals, soil organic matter, plant growth-enhancing bacteria, and top nutrient rich soil. The fertility of the soil might be low are high as it depends upon the soil conservation practices.

Nitrogen (N), Potassium (K) and Phosphorous (P) are very essential for plant growth and also for the enriching of reproductive parts, activating enzymes and metabolism carbohydrate. The plants have no direct supply of Nitrogen and phosphorous. We are rooted in organic matter. Potassium (K) is in elemental form and can be substituted for or as part of mineral lattices. Calcium (Ca) and magnesium (Mg) also interact with soil development and activate a variety of enzyme systems in plants. The deficiency of any of these elements has retarding impact on the growth of plant.

Table 3: Rating of nutrients

Rating	Carbon (%)	N (kg/ha)	P (kg/ha)	K (kg/ha)
Very Low	<0.3	<150	<5	<200
Low	0.3-0.5	150-250	5-10	200-250
Medium	0.5-0.75	250-400	10-20	250-400
High	0.75-1.0	400-600	20-40	400-600
Very High	>1.0	>600	>40	>600

3. RESULTS AND DISCUSSION

3.1 Impact of Surface Water and Ground Water on Crop Production

Poor water quality with high salinity of soil affects the plant growth. The increase in the saly content in the soil is toxic to plant. High EC in soil is affects plant due to high osmotic pressure water uptake and root zone.

The high salinity in soil is due to higher salt concentration in soil, resulting in less water available for plant, higher water stress and root dehydration resulting in lower crop.

Alkaline soils are sodic and dispersive with slow infiltration rates and low hydraulic conductivity, lumps of soil formed causes poor aeration.

Excessive sodium inhibits the supply of the water required for the crops. The effect of destroying soil structure in plant growth and soil permeability is due to excess sodium in water.

3.2 impact of Surface Water and Ground Water on Soil

Surface water is alkaline in nature. Alkaline waters (High p^H) and high residual carbonate (carbonate greater than Ca and Mg) in irrigation water results in deficient nutrients.

Water with high alkalinity high bicarbonates level often has a p^H value of 7 or above, but water with high p^H is not always high alkalinity. This is critical because high alkalinity, not p^H, has exerts the most significant effects on the growth medium fertility and nutrition for plants

Electrical Conductivity (EC) is the measure of soluble salts in water. Excess soluble salts impair root function, which can lead to reduced water absorption and deficiencies of nutrients.

Water were collected and analyzed from 5 separate bore wells near the Bathi Lake. Acidity in bore wells is high; Soil p^H is the indicator of soil's acidity or alkalinity. The p^H of soil can have many effects on plant growth. Bacteria that modify and release nitrogen from organic matter and certain fertilizers function best in the p^H range of 5.5 to 7.0 making this the optimum p^H range.

P^H is not a fertility predictor but it affects fertilizer nutrients supply. The soil may contain adequate nutrients yet an unfavorable p^H level may limit plant health.

4. CONCLUSIONS

Water quality depends on the type of the pollutant added and the existence of the mineral present in specific bore well region. Monitoring of groundwater quality is achieved by collecting representative water samples and evaluating the physico-chemical characteristics of water samples at various locations of the Bathi Lake. The lake is contaminated because residential waste water entry impacts lake quality of lake, and acidity is found high in lake. The lake is polluted by influx of household waste water into lake, as well as by agricultural activities across the lake. This means that the lake water is inadequate for human use and should therefore not be used without adequate care.

Soil is a mixture of minerals, gases, liquids, microbes, and organic matter that is important for plant production. Soil quality is a crucial factor in keeping food security going. Soil nutrient is exchanged between organic matter, water, soil and these forms fundamental soil fertility components. The findings obtained from this study show that the organic carbon, minerals, microbes were moderate in quantity in order to preserve fertility of soil water holding ability.

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