The Physico – Chemical Analysis of Pond Water at AIET Campus Due to the Overflow of Sewage Water

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Abstract

We have investigated the water quality of the pond located in the AIET campus. The pond which was greenish tan and cloudy appearance, typically contains a large water fowl population and their waste has contributed to decrease the water quality. In an effort increase the water quality we have removed all the floating materials.

We have investigated the status of the pond, we measured pH turbidity, acidity and few more physical properties and we also concentrated on the microbial analysis, during this analysis we have found that the water is not pure and it cannot be used for the domestic purpose. The values obtained for the physical, chemical and microbial analysis are not to standards. We have conducted the experiments during the pre-monsoon and post monsoon seasons and we have come across with an idea of installation of sand filters, Stone pitching and creation of percolation ponds surrounding to the pond.

Keywords: *pH turbidity, acidity, microbial analysis*

Introduction

In recent years, the growth of industry, technology, population, and water use has increased the stress upon both our land and water resources1. Locally, the quality of ground water has been degraded. Municipal and industrial wastes and chemical fertilizers, herbicides, and pesticides not properly contained have entered the soil, infiltrated some aquifers, and degraded the ground-water quality2. Other pollution problems include sewer leakage, faulty septic-tank operation, and landfill lea hates3. Water is one of the most important and abundant compounds of the ecosystem. All living organisms on the earth need water for their survival and growth. As of now only earth is the planet having about 70 % of water. But due to increased human population, industrialization, use of fertilizers in the agriculture and man-made activity it is highly polluted with different harmful contaminants. Therefore it is necessary that the quality of drinking water should be checked at regular time interval, because due to use of contaminated drinking water, human population suffers from varied of water borne diseases. It is difficult to understand the biological phenomenon fully because the chemistry of water revels much about the metabolism of the ecosystem and explain the general hydro - biological relationship.

The availability of good quality water is an indispensable feature for preventing diseases and improving quality of life. Natural water contains different types of impurities are introduced in to aquatic system by different ways such as weathering of rocks and leaching of soils, dissolution of aerosol particles from the atmosphere and from several human activities, including mining, processing and the use of metal based materials. The increased use of metal-based fertilizer in agricultural revolution of the government could result in continued rise in concentration of metal pollutions in fresh water reservoir due to the water run-off. Also, faucal pollution of drinking water causes water born disease which has led to the death of millions of people.

People on globe are under tremendous threat due to undesired changes in the physical, chemical and biological characteristics of air, water and soil. These are related to animal and plants and finally affecting on it (Misra and Dinesh 1991). Industrial development (Either new or existing industry expansion) results in the generation of industrial effluents, and if untreated results in water, sediment and soil pollution.

Scope and objectives for the study:

The quality of water in the AIET pond in Mijer t is to be studied due to the continuous overflow of sewage in to the pond with out any treatment. Due to the percolation, the pond water seep in to nearby water sources like bore well and well are completely polluted. Hence the study of ground water quality around the pond is polluted.

Objective:

 i. To Study the Physico–Chemical parameters in the pond water of AIET.
 ii. To evaluate the ground water quality in the wells and bore wells around the Pond
iii To determine the capacity of the pond.
iv. To assess the water quality of pond, through analysis of some selected water quality parameters.
v.To determine environmental condition of the pond and predict pollution status.
vi.To compare the result with that of standard limits and looking out for any progress methodologies for the improvements of the pond.

Field Survey:
Sewage tank is located western side of the pond. The discharge of wastewater from the sewage tank over flow into the low-lying areas and finally collected in the pond. The wastewater and sewage are highly polluted and affects the ground water around the pond at a alarming rate. The pond water is highly salty and becomes unfit for human consumptions. The polluted water in the pond percolates into the ground around the Pond. The investigator during survey- observed that the ground water is used for drinking purposes. The ground water quality is badly affected also the lands near the pond are mostly barren and unfit for cultivation[14]. The pond and the ground water quality cause many water born diseases. The high total dissolved solids in the pond water and ground water are the reasons for salty taste of the water. In order to find the pond water pollution and the ground water pollution, water samples were collected from 4 different locations in and around the pond. During the survey the investigator found that the people had very good drinking water before 25 years. Study of water quality in the pond and the ground water sources are very useful for the people. They want proper treatment using sand filters technology will help the people to get portable water in the study area.

Material and Methods
Location of the Study Area: Mijar is village of Mangalore district of Karnataka. It lies between 13.0235 ° arid 74.969764° of North latitude and 13.02339° and 74,96938° of East longitude.mostly by laterite soil. North East Monsoon benefits D. K. with a mean annual rainfall of 42.66%. The mean sea level is 280.11 meter. Groundwater in Mijar AIET Campus area is highly polluted due sewage over flow.

Choice of the Study Area: AIET hostels are located around the Pond. It is located on Mangalore highway of D.K . The Pond is a natural one .Birds living around the pond are depending on pond water. The pond water and the ground water were taken for the study.

Figure 1

Figure 2 (pond)

Method of Sampling and Analysis of Water Quality

Parameters:

Water samples from the Pond and the wells and bore wells on all directions in and around the Pond were collected from the sampling sites in a clean polythene bottle. Dissolved oxygen (D.O) was analyzed immediately after collection at the site using DO meter. Water samples were brought to the laboratory for analyzing the physico-chemical characterises of water. Areas where the samples were collected and checking of diameter are shown in the figure 3. Samples were analyzed by as per standard methodology. The samples were collected during pre monsoon months. The results are tabulated.

Figure 3

RESULTS AND DISCUSSION

Water Quality Parameters

Temperature: Water temperature plays an important role in aquatic ecosystems. The variations in temperature are influenced by the factors such as air temperature, humidity, wind and solar energy. The monthly average atomerpheric 32° and water temperature 27°.

Electrical Conductivity:

Electrical Conductivity denotes the ability of an aqueous solution to carry electric current, which depends on the presence of ions, their total concentration, mobility, valence, relative concentrations and temperature. The monthly average electrical conductivity values are recorded as 13.40 μS/cm.

pH:

pH is defined as the intensity of the acidic or basic character of a solution at a given temperature. Its range from 0 to 7 is diminishingly acidic, whereas values of 7 to 14 are increasingly alkaline. pH of the water is largely governed by carbon dioxide, carbonates and bicarbonates equilibrium. The monthly average value of pH is found to be 6.13

Dissolved Oxygen (DO):

The oxygen content of water varies with temperature, turbulence, salinity, increased photosynthetic activity and respiration by microalgae and atmospheric pressure. The DO in water affects the oxidation-reduction state of many of the chemical compounds such as nitrate, ammonia, sulphate and sulphite, ferrous and ferric ions. DO present in the pond water is 4.2 mg/L

Biochemical Oxygen Demand (BOD):

BOD is the amount of oxygen utilized by microorganisms to stabilize the organic matter under aerobic conditions. BOD determines the strength of sewage effluent and other polluted waters and provides data on the pollution load in all natural waters. The values of BOD of pond water is 2.7 mg/L .

Chemical Oxygen Demand (COD):

COD determines the amount of oxygen required for the chemical oxidation of most organic matter and oxidizable inorganic substances with the help of strong chemical oxidant. The COD Value of pond water 32mg/L.

Total Alkalinity:

Alkalinity of the water is the capacity to neutralize strong acids, which is primarily a function of carbonate, bicarbonate and hydroxide content and formed due to dissolution of CO_2 in water. The Value of pond water is 46mg/L $CACO_3$.

Chloride:

 Chloride is found widely distributed in
nature in the form of salts of sodium, potassium and calcium. The high chloride concentration of the pond water may be due to high rate of evaporation or due to organic wastes present in water. The chloride concentration was observed 1099.7mg/L .

Total Hardness:

Hardness is generally caused by the calcium and magnesium ions present in the water. The value is48mg/L as $CACO_3$. The photosynthetic activity, loss of CO_2 due to high pressure, or precipitation of calcium carbonate
increases the water temperature and contributes to the depletion of calcium.
 The value for calcium hardness was observed as0.56mg/L.
The values of magnesium hardness is 0.3mg/L.

Biological Parameters

Algae represents a large group of plant-like organisms that are usually photosynthetic and aquatic, but do not have true roots, stems, leaves, vascular tissue and have simple reproductive structures. The unicellular forms are known as microalgae where as the multi cellular forms comprise macro algae. Algae are important indicators of ecosystem health and integrity because they form the base of most aquatic food chains. Algae are also an excellent indicator of water quality, as their abundance and community composition most often reflects (and has the capacity to affect) the chemical properties of water such as pH and nutrient levels.

Materials:

Project work was carried out from July 2018- October 2018. During our study, water samples from 2 different locations were collected in 2 separate disinfected plastic bottles. These bottles were thoroughly rinsed with distilled water and then with pond water. Then it is observed for diversity of microscopic algae under 45X magnification of Binacular light microscope. We have identified 15 species of microscopic algae with the help of algal manuals and with the help of experts in algal identification.
MPN TEST: Positive
MPN Value: 1600
Confirmative test for *E.coli* – Positive

E.Coli Positive   **Positive result for MPN**

CONCLUSION

The analysis of different physico-chemical characteristics of water collected from the AIET Campus, Centenary pond, Mangalore showed a significant improvement of water quality owing to algal and duckweed uptake. The growth of algae and duck weeds accounted for ~45 % of nutrient removal. Furthermore indigenous algal consortia
played important role in nutrient removal by their abilities to adapt and grow at variable nutrient regimes. A transition in nutrient uptake was observed during April, due to variability in the feed rate and higher sediment upwelling
i.De-silting to be done to maintain the depth & increase water holding capacity.

ii.Constructing the walls around the pond.

iii.Construction of sand filters.

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