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ABSTRACT

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Water Quality Analysis of Devtal and Gangasagar Lake at Jabalpur (M.P.)

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This paper presents a water quality study performed on two small domestic ponds devtal and ganaga sagar state of M.P., India. The specific contaminants leading to pollution in water include a wide spectrum of chemicals, pathogens and physical changes.

Water quality is one of most critical factors besides good feed/feeding in fish production and it varies with culture systems or media amongst other factors. Several water quality parameters should normally be sampled and tested to ascertain water quality, and the data recorded. These include pH, dissolved oxygen(DO), biological oxygen demand (BOD), temperature, conductivity, turbidity, and discharge or flow measurements. Hanumantal lake and Robertson lake are well known lakes of Jabalpur city and it is located in populated area. Data provided by present investigation is useful in designing water quality management issues.

KEYWORDS : Dissolved oxygen, total hardness, alkalinity, iron ,chemical oxygen demand

Introduction

Water quality parameters can be divided into three main categories: physical (density, temperature); chemical (pH, conductivity, nutrients) and biological (bacteria, plankton and parasites) (Delince, 1992 and Moody, 2005). Water is an essential component for survival of life on earth which contains minerals, for important for humans as well as for earth and aquatic life. Surface water reservoirs are the planets most important freshwater resources and provide innumerable benefits .All living organisms have tolerable limits of water quality parameters in which they perform optimally. A sharp drop or an increase within these limits has adverse effects on their body functions (Davenport, 1993). They have important social and economic benefits as a result of tourism and recreation and are culturally and aesthetically important for people throughout the world(2). They also play an equally important role in flood control .Jabalpur is one of the major cities of M.P. state in India . Water quality is one of the most critical factors besides good feed/feeding in fish production. It is not constant; varies with the time of the day, season, weather conditions, water source, soil type, temperature, stocking density, and feeding rate and culture systems. For a successful aquaculture venture, the dynamics and management of water quality in culture media must be taken into consideration. In present investigation Water quality of devtal and gangasagar lakes are sampled and tested to ascertain water quality and the data recorded. Data provided by parameters are useful in designing water quality management issues.







Experiment

Surface water samples under investigation collected one time six different sites each lake during winter season and composing sample prepared for analyses .During the sampling period overall climatic condition was little cloudy followed by minor rain fall at some location . Grab samples of water were collected in high grade poly propylene bottles in triplicate and mixed to get a composite sample for each site. Six samples were taken from each site different position (surface, middle and bottom), which were homogenized and the composite samples were stored in high grade poly propylene bottles. All the sample bottles were stored in iceboxes till brought to the laboratory for analysis. Solutions used for the studies were prepared from analytical grade chemicals, in double distilled water or in high purity organic solvents. Water analysis was carried out by standard methods. The temperature was measured using a mercury filled centigrade thermometer on site. Dissolved oxygen is trapped on the site Wrinkler method Total hardness, Temporary and permanent hardness is determined by EDTA complex metric titration using EBT (Eriochrome black T) Physical parameter *i.e.* pH was determined by digital pH meter (Thermo Orion), electrode was calibrated as per instructional manual by Merk made for buffer solution. The conductivity and Total dissolve solid was determined by the conductivity meter (Mettler Toledo MC-226 conductivity meter). Turbidity and colour determined by Merck Spectrophotometer (Spectroquant NOVA-60). Fluoride determined by digital meter (Thermo Orion), electrode which was calibrated as per instructional manual. Chloride was determined by titration method. The heavy metals determined by using Spectrophotometer (Thermo electron corporation and Pharo-300 Merk made), BOD determined by the TS-606 (Merck). COD determined by the Merk Spectroquant TR-302.

Result and discussion

There are many waterquality variables in pond aquaculture, but only a few of these normally play an important role. Increases in overall productivity in relation to water use are desirable in the context of rising pressure toutilize water more efficiently. Successful pond management requires an understanding of the role of nutrients and other water quality parameters, as well as regular monitoring of environmental conditions within the pond's ecosystem. Water quality is often overlooked in pond management, and poor water quality can lead to common problems, such as excessive algal blooms, overgrowth of plants, noxious smells, or dead and dying fish. In order to prevent these problems, an understanding of basic water chemistry and other physical parameters is necessary. Some important parameters are as follows :-

A. Physical Parameters

1.Colour and odour : colour and odour from lake is first sign of its pollution .

2.Temperature: Temperature of water is basically important because it effects biochemical reactions in aquatic organisms. A rise in temperature of water leads to the speeding up of chemical reactions in water, reduces the solubility of gases and amplifies the tastes and odour. Data is reported in table-1(3).

3.pH: High pH levels are undesirable since they may impart a bitter taste to the water. Furthermore, the high degree of mineralization associated with alkaline water will result in the encrustation of water pipes and water-using appliances. The combination of high alkalinity and calcium with low pH levels may be less corrosive than water with a combination of high pH, low alkalinity and calcium content. High pH levels also depress the effectiveness of disinfection by chlorination, thereby requiring the use of additional chlorine or longer contact times. A range of pH 6.5-8.5 was determined because it would achieve the maximum environmental and aesthetic benefits(4).

4.Turbidity :Turbidity is a measurement of the cloudiness of water, measured by passing a beam of light through the water and measuring photometrically. Cloudiness is caused by material suspended in water. Clay, silt, organic matter, plankton and other microscopic organisms cause turbidity in natural water. This has been recognized as a valuable limiting factor in the biological productivity of the water bodies. In the present study the turbidity of samples was reported in table-1(5).

5.Total dissolved solid (TDS) :In natural water, dissolved solids are composed mainly of carbonates, bicarbonates, chlorides, sulphates, phosphates, nitrates, calcium, magnesium, sodium, potassium, iron and manganese etc. They originate from dissolution or weathering of the rocks and soil, including dissolution of lime, gypsum and other slowly dissolved soil minerals. Data is reported in table-1(6).

6.Electrical conductivity (EC) :The data of EC is reported in table-1.EC is the measure of the ability of an aqueous solution to convey an electric current. This ability depends upon the presence of ions, their total concentration, mobility, valence and temperature(7).

Table-1: physical Parameters

Sel.no	Parameter	devtal Lake	gangasagar Lake
1 2 3 4 5 6 7	Colour Odour Temperature pH T.D.S Electrical conduc- tivity Turbidity	Greenish black Objectionable 24.7 8.1 140ppm 0.045 1.5NTU	Colourless Objectionable 20 7.9 170ppm 0.078 3.0NTU

B. Chemical parameters

1.Alkalinity :The measurement of alkalinity is based on principle of acidimetric titration, by using different indicators like phenolphthalein, methyl orange. Values are reported table -2(8).

2.Total hardness (TH):The total hardness (TH) of water sample was determined by complexometric titration with EDTA using Eriochrome black-T as indicator. In present study value is very high (8).

3.Chloride : Chloride in water is generally due to the salts of sodium, potassium and calcium in the present study the chloride content. Excess of chloride in inland water is usually taken as index of pollution. Large contents of chloride in freshwater is an indicator of pollution. The sewage water and industrial effluent are rich in high chloride and hence the discharge of these wastes result in high chloride level in fresh water is more than 250 mg/L for chloride is the level above which the taste of the water may become objectionable to the consumer. In addition to the adverse taste effects, high chloride concentration levels in the water contribute to deteriorate on of domestic plumbing, water heaters and municipal water works equipment. High chloride concentrations in the water (9).

4.Dissolved oxygen (DO): Dissolved oxygen analysis measure the amount of gaseous oxygen (O_2) dissolved in an aqueous solution. A small amount of oxygen, up to about ten molecule of oxygen per million of water, is normally dissolved in water. values are given in table -2(10).

5.Biochemical oxygen demand (BOD) :The biochemical oxygen demand, abbreviated as BOD, is a test for measuring the amount of biodegradable organic material present in a sample of water. The results are expressed in term of mg/L of BOD which microorganisms, principally bacteria will consume while degrading these materials and data is reported in table-2. As the measurement of BOD takes too long time (20 days at 20 °C), the determination of BOD after 5 days incubation is preferred (BOD), BOD value is high for Robinson lake (10).

6.Chemical oxygen demand (COD):Chemical oxygen demand is a rapid test which measure the oxygen required for the oxidation of all the substance present in water, included those are not biologically decomposable. COD is a reliable parameter for judging the extent of pollution in water. The COD of water increases with increasing concentration of organic matter. Chemical oxygen demand value given in table- 2(10).

7.Iron :In the present study the concentration of iron in all lakes water samples ranging from 0.5-0.9 mg/Las shown in table -2.

8.Phosphate : It occurs in natural water in low quantity as many aquatic plant absorb and store phosphate many times their actual immediate needs. In our study it reported in traces.

Table-2: Chemical Parameters

Sel.no	Parameter	Devtal Lake	Gangasagar Lake
1 2 3 4 5 6 7 8 9 10	DO BOD COD Total Hardness Permanent hardness Temporary hardness Alkalinity Chloride Iron Phosphate	8.36 2.0 4.5 230 130 100 67 49 0.5 traces	6.0 3.5 7.5 380 240 140 133 35 0.46 traces

Conclusion

In the present investigation water quality analysis helps in water quality management for both lakes. Water quality guidelines provide basic scientific information about water quantity parameters and ecologically relevant toxicological threshold value to protect specific uses of water Maximum number of physic-chemical parameters are showing deviation from standard values for both lakes . It is recommended that a policy is developed for water allocation linking ecological, hydrological and socio-economic aspects of life, with the involvement of all of the stake holders.

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