

Original Research Article

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Physico-chemical and Cyanophitic Variation of Ganga Sagar Lake, Jabalpur

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ABSTRACT

Keywords

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The present studies focused on the Physico-chemical parameter and Cyanophitic diversity of Ganga Sagar Lake, Jabalpur. The physicochemical parameters like temperature, water temperature, D.O., pH, free CO₂, Total alkalinity, total hardness, calcium hardness, chloride, phosphate and nitrate were studied to analyze the Ganga Sagar Lake, Jabalpur. The study area selected was Cyanophitic diversity has been done with scientific name in this Lake. In these studies, an attempt has been made to identify the taxa of Cyanophyta in Pre-monsoon, monsoon, summer and Post monsoon from July 2017 to June 2019.

Introduction

Jabalpur is situated at a distance of 308 km from the capital city of Bhopal. It is located at 23°10'57" N and 79°55'54"E. and MSL 410 M Latest archeological excavations have revealed that the city is nearly 4000 years old. Jabalpur is called the city of the lake at one time there were 52 lakes in Jabalpur, out of which 13 lakes are dried up. The Supatal Lake is situated in the Mahakausal region of Jabalpur. It lays behind the Ramayana Temple Garha Jabalpur. Surrounded by Hanumanbagh Temple nearby, NH-7 road, mountains, and temples. Every living organism needs

water to survive. Plants need water to make food. All animals depend on plants for food either directly or indirectly. Therefore without water, all life forms will cease to exist. With the ever-increasing population, water is becoming a scarce commodity. To worsen this situation, the few available sources of water for consumption by living organisms are being depleted at an alarming rate. Careless release of wastes into water bodies is also a major problem today.

The water level of any water body mainly depends upon the climatic condition especially the rainfall in the catchments area,

atmospheric temperature, evaporation and draw of water for domestic use or any other uses. The depth of water of the Ganga Sagar Lake, Jabalpur markedly decreases in summer due to evaporation loss as well as due to the draw of water for various uses. Studies conducted by Tamot (1994) revealed that the water level decreased gradually from October to June when the lowest level was reached.

Thereafter the level rises again during the rainy season in July to September. Reasons for such fluctuations are greater evaporation during the summer months, which are characterized by high temperature and low relative humidity. This study conducted during 1991-92 does confirm that transpiration loss of water was not significant, since macrophytic vegetation was absent.

Location Longitude 79°54'41"E, Latitude 23.09°28" N. Hydrology- Catchment area 18.636 hectares, Submergence area, 16.29 ha., Gross storage, 12.83 million cubic meters, Live storage 5.18 meters, Maximum depth 7.23 meters, Minimum depth 4.03 meters, Lowest still level (LSL) 2.69 ha., Full reservoir level (FRL) 0.18 meters, Water spread at FRL Approx. 0.76 ha.

Materials and Methods

Fortnightly collections of water samples were collected from all the stations *i.e.* from four sampling stations of Ganga Sagar Lake, Jabalpur. Parameters such as atmospheric temperature, water temperature, D.O., pH and CO₂ were studied at the sampling stations as they are liable to change soon. Total alkalinity, total hardness, calcium hardness, chloride, phosphate, and nitrate parameters were analyzed in the laboratory on the same day of collection. All Physico-chemical parameters were determined adopting methods given by APHA (1998), NEERI (1986), Trivedi and Goyal (1986) and Adoni (1985).

The algal sample collection was carried out with the help of a truncated cone shape plankton net. The plankton net is made of bolting silk No.25 standard grade. This has an aperture size of 0.064mm. The concentrate was preserved in 4% formalin for study (Welch, 1952 and Lind, 1979).

Observation

Detail of the Physico-chemical characteristics of water of ponds the present study from July 2017 to June 2019 are given below. The data have been collected by the middle of the month when there was particularly no rainfall. The changes in Physico-chemical parameters are the direct and indirect indices of the quality of ponds water. The proper analysis of these factors enables us to characterize the degree of water pollution.

Physico-chemical observations

The temperature of Ganga Sagar Lake, Jabalpur did not differ much. It ranges between 14.0°C to 31.0°C, the maximum temperature recorded in May 2008, during 2017-08, and second-year maximum temperature was recorded in May and June 2019 and minimum temperature value was recorded in January was both years. (Fig-1), Ganga Sagar Lake, Jabalpur the maximum D.O. value was 12.8 mg/liter in March 2019 and minimum was 5.2 mg/liter in August, 2008 (Fig-2), pH of Ganga Sagar Lake, Jabalpur ranges from 7.4 to 8.6. The maximum value of pH was observed in Ganga Sagar Lake, Jabalpur in June. (Fig-3), free carbon dioxide value ranged recorded from 0.3 mg/litre to 2.8 mg/litre.

During 2017-18 the maximum free carbon dioxide value in June 2018 and minimum value in July 2017 and January 2018 and second-year the maximum value was 2.8 mg/liter in January 2019 and the minimum

free carbon dioxide value recorded was 0.3 mg/liter in April 2019. In February and March 2019 free carbon dioxide value was nil (Fig-4). In the present study, total alkalinity varied from 70 to 583 mg/l in the water of Ganga Sagar Lake, Jabalpur.

In the present study total alkalinity, highest values were recorded in February and April and the lowest alkalinity values were associated with August and September months (Fig-5), the calcium hardness value ranged recorded from 16.6 mg/liter to 41.5 mg/liter. During 2017-18 the maximum calcium hardness value in June 2018 and minimum value in December 2017 and second-year the maximum value was 38.7 mg/liter in April 2019 and minimum value recorded was 22.8 mg/liter in November 2018 (Fig-6), chloride of Ganga Sagar Lake, Jabalpur did not differ much.

The chloride content showed the highest value of 70 mg /liter in June 2018 and the lowest value of 46 mg/liter in February 2018 (Fig-7), chloride of Ganga Sagar Lake, Jabalpur did not differ much. The chloride content showed the highest value of 70 mg /liter in June 2018 and the lowest value of 46 mg/liter in February 2018 (Fig-8), Phosphate content range from 0.70 mg/liter to 1.16 mg/liter.

In April and June 2019 the phosphate contents were minimum and in December 2017 the phosphate contents maximum (Fig-9), Nitrate content ranged from 0.008 mg/liter to 0.128 mg/liter. In April 2019 the nitrate contents were minimum and in May 2019 the nitrate contents were maximum (Fig-10).

Results and Discussion

Seasonal variations are evident in all the Physico-chemical parameters examined. Temperature is one of the most important ecological features that is a limiting factor for

the growth and distribution of flora and fauna in any aquatic ecosystem.

Many workers while discussing the periodicity distribution and growth of Cyanophyta have laid much stress on the water temperature. According to Stroikine (1963), Hutchinson (1967), Hammer (1971) and Lin (1972) dense population blue-green algae are often associated with fairly high water temperature.

The distribution and growth of Cyanophyta members are attributed to a high temperature by Butcher (1924). Chakaraborty *et al.*, (1959), Venkateshwarlu (1969) and Wilde and Tilly (1981) have also stressed the importance of water temperature in the periodicity of blue-green algae. Chu and Tiffany (1951) and Rao (1955) have stressed more on the significance of bright sunshine than temperature. Lin (1972) observed that relatively high summer water temperature favored the blue-green algal blooms and results in the high concentration of organic matter.

Pearsall (1932) have pointed out that blue-green ware was observed in summer. Kaliyamurthi (1975) observed a peak of blue-green algae in January to April and Singh and Swarup (1979) noted a peak in April to October, Zafar (1967), Biswas (1972), Khare (2017), Khare and Patil (2011), Mahajan *et al.*, (2010) and Anand (1988) have reported that blue-green started increasing in early summer and attained their maxima in the middle of the summer season. According to Spancar and King (1989), the surface bloom of blue-green algae is present during the summer in many eutrophic lakes. Singhal (1986) found the Cyanophyta group dominating over other groups throughout the year and with the peak in April. In a previous observation on the lake, Valecha (1985) observed maxima growth of Cyanophyta in June and minima in winter.

Fig.1 Temperature

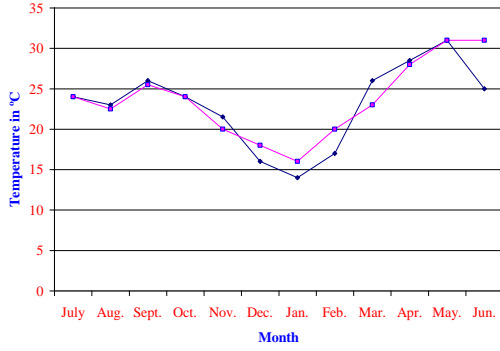


Fig.2 D.O. value

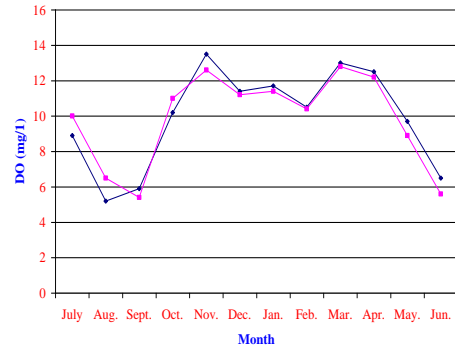


Fig.3 pH value

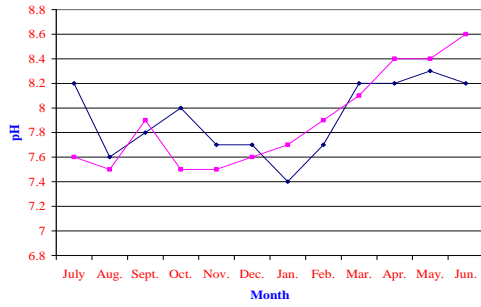


Fig.4 Free CO₂ value

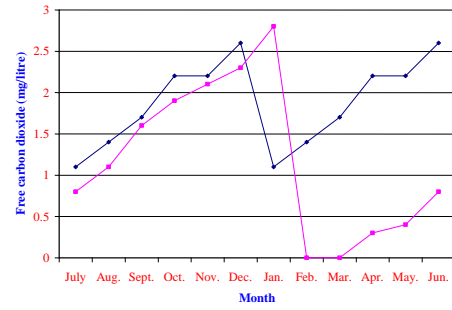


Fig.5 Total alkalinity

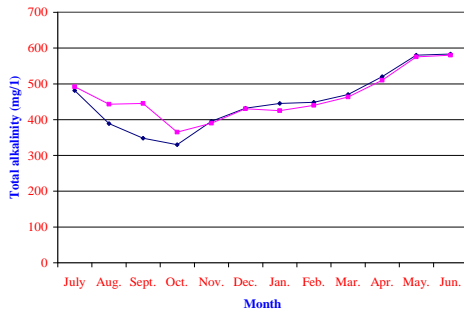


Fig.6 Total hardness value

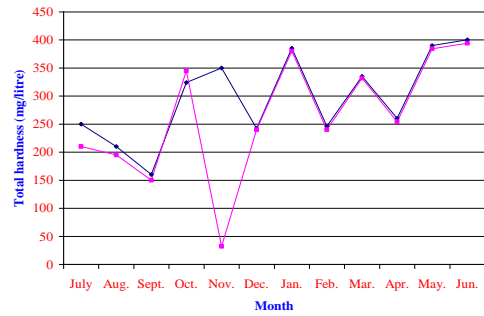


Fig.7 Calcium hardness value

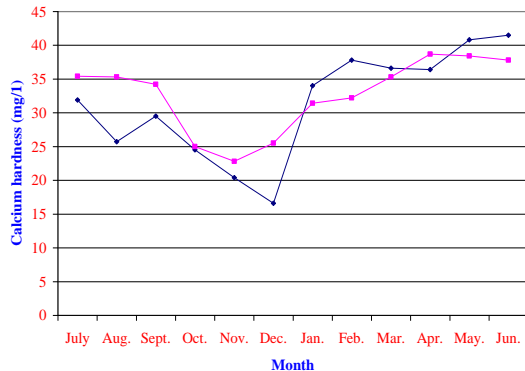


Fig.8 Chloride content

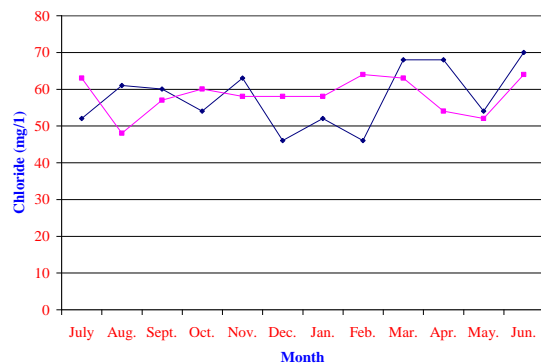


Fig.9 Phosphate content

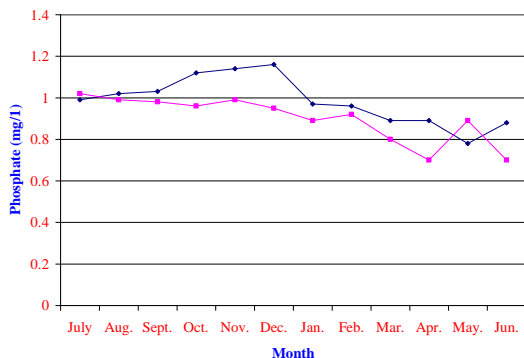
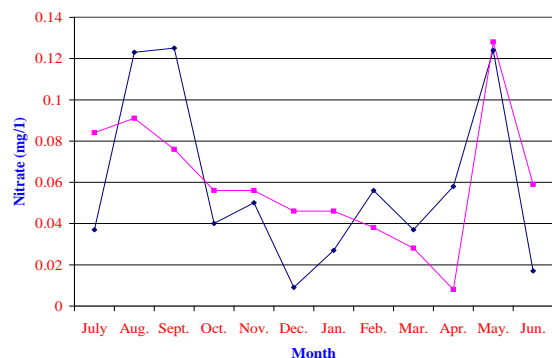


Fig.10 Nitrate content



In April, May and June oxidizable organic matter was increased with the increased temperature. Rao (1955), Zafar (1967), Parmasivam and Sreenivasan (1981) have also confirmed the maximum of blue-greens with high concentrations of oxidizable organic matter. Desikachary (1959) supported that bicarbonates play a significant role in the maxima of Cyanophyceae.

In the present study of Ganga Sagar Lake, Jabalpur found forty seven species of order Chroococcales were found such as *Microcystis aeruginosa*, *M. elongate*, *M. flos-aquae*, *M. protocystis*, *M. pseudofilamentosa*, *Chroococcus limneticus*, *C. micrococcus*, *C. minor*, *C. minutus*, *C. turgidus*, *Gloeotheca rupestris*, *G. samoensis*, *Aphanocapsa pulchra*, *Aphanocapsa nidulans*, *A. pallida*, *Dactylococcopsis fascicularis*, *D. raphidiodes*,

Gomposphaeria aponica, *G. lacustris*, *Merismopedia elegans*, *M. glauca*, *M. punctata* and *M. tenuissima*. Order Nostocales such as *Arthospira jenneri*, *Oscillatoria acuta*, *O. amphibian*, *O. amphigranulata*, *O. chalybea*, *O. curviceps*, *O. foreau*, *O. formosa*, *O. grunowiana*, *O. jasorevensis*, *O. laete-virens*, *O. laete-virens* Gomont var. *minimus*, *O. limosa*, *O. nigra*, *O. princeps*, *O. salina*, *O. sancta*, *O. subbrevis*, *Phormidium bohneri*, *P. calcicola*, *P. subincrustedatum*, *Lyngbya hieronymusii*, *L. magnifica*, *L. majuscula*, *L. spirulinoides*, *Anabaenopsis arnoldii*, *Cylindrospermum doryphorum*, *C. indicum*, *C. sphaerica*, *Nostoc commune*, *N. sphericum*, *Anabaena ambigua*, *A. aphanizominoides*, *A. flos-aquae*, *A. spiroides*, *Raphidiopsis indica*, *Raphidiopsis mediterranea*, *Aulosira fritschii*, *Scytonema coactile*, *S. pascheri*, *Tolypothrix nodosa*,

Calothrix castellii, *Rivularia aquatica*, *R. baccariana*, *R. dura*, *Gloeotrichia kurziana*, and *G. raciborskii* var. *kashiense*.

The Ganga Sagar Lake, Jabalpur different genera in order of frequency of occurrence were *Oscillatoria* were dominant of 70 taxa and by predominance species of *Microcystis*, *Chroococcus*, and *Merismopedia*, Lyngby, *Merismopedia* and *Anabaena* in the peak period of Ganga Sagar Lake, Jabalpur.

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