



Studies on Pollution Indicators Species and Water Quality Status of Sakkardara Lake, Nagpur (M.S.)

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Abstract

The study of phytoplankton is an important aspect of aquatic biology. Aquatic floral species were very sensitive and in a given aquatic body, these species serve as indicator of pollution. Phytoplankton species respond to physico-chemical factors and tend to represent variously in a given time. In the present paper it was tried to document the group of such species and their seasonal presentation in relation to physico-chemical factors and also focused towards the understanding the ecology. Sakkardara Lake aquatic body was selected to analyze physico-chemical parameters in relation to pollution indicator species observed and noted. The study was carried out during the period 2012-13. The result revealed that there was significant seasonal variation in physico-chemical parameters, which correlate with the distribution of pollution indicator species, Indicators of pollution and to assess the trophic status of water body. Most of the parameters in the present study were in the acceptable range and from results it is concluded that the lake remained semieutrophic. The parameters such as temperature, DO, TDS, phosphate, nitrate and sulphate were studied.

Keywords: Sakkardara, physico-chemical, phytoplankton, semieutrophic, TDS.

Introduction:

An environmental consequence of growing population is increasing pressure on natural resources. Demand for water is increasing rapidly as population and industrial activities are expanding and irrigated agriculture continues to increase. Water shortage has already become critical in some regions, posing obstacle to continue development and threat to fresh water habitat. Water as a natural resource is becoming a scarce commodity due to its indiscriminate use and contamination from various sources and leaching of chemicals from farms, untreated domestic waste from cities. The increase anthropological influence in the recent years in and around aquatic system and their catchment areas have contributed to a large extent to deterioration of water quantity and dwindling of water bodies leading to their accelerated eutrophication (Bhatt et al.,1999). Phytoplankton constitutes the very basis of nutritional cycle of an aquatic ecosystem. They form a bulk of food for zooplankton, fishes and other aquatic ecosystem dependant on the abiotic characteristics of water and the biological diversity. (Harikishan et al.,1999). The phytoplankton study is very useful tool for the assessment of water quality (Pawar et al., 2006). Algae are natural pollution indicator of water and system growth of algae is usually limited by the small quantities of inorganic nutrient dissolved in surface water. Study on physico-chemical and biological parameters of aquatic bodies has been done by many researchers in India (Pendse et al., 2000 andShivakumar et al., 2000).

Present investigation was carried out to study various physico-chemical parameters and phytoplanktons of Sakkardara Lake in Nagpur District.



Study Area:

Sakkardara Lake is situated at distance of 7 to 8 kms from zero mile of Nagpur city of latitude $21^{\circ} 9' N$ and longitude $79^{\circ}9'E$. The emphasis is laid here that a beautiful design of art and architecture with layout of the city during the Bhonsala was specially planned during the regime of Raghuji-2. There is famous temple of VitthalRukmini and Lord Vishnu placed on the shore of Sakkardara lake.

Lake water is used for recreational, fishing and for satisfying human needs from ancient time but now lake water is polluted due to idol immersion, domestic waste and sewage discharge from nearby areas. This is responsible for algal growth and increase the water pollution. We have to conserve this water body from deterioration and maintain the beauty of the city.

Material and Methods:

The water samples were collected from surface by conical plankton net with a bottle at the end 200 meshes/cm., Bolton silk conical plankton net is used for sampling during winter, monsoon and summer seasons for the period of 2012-13 in pre-wash polythene containers. The sampling was always done during early hours of morning at all sites. Algal samples were identified in laboratory by using phase contrast microscope and by following algal taxonomy books. Few parameters like water temperature, pH, transparency, DO were recorded at the sampling site and other parameters like alkalinity, magnesium, sulphate, phosphate and nitrate were estimated in laboratory by using standard methods for the estimation of water (APHA, 2005).

Result and Discussion:

Distribution of phytoplankton and their variation at different zones of water body is known to be influence by the physico-chemical parameters of water (Yeragi et al., 2003). Climate condition is the main controller for the formation of phytoplankton. Phytoplankton study provided relevant and convenient point of focus for research on eutrophication and its adverse effect on an eco-system. Planktons were found to be temperature dependant during summer and winter months. Physical factors such as temperature, pH, dissolved oxygen, free carbon-di-oxide and total alkalinity control phytoplankton's diversity and density. The increase in the phytoplankton's density and diversity indicates that the pollution get rise in the lake water. The water temperature is one important parameter which directly influences some chemical reaction in water body.

In present work, the species composition of phytoplankton revealed a total number of five species from different seasons indicates pollution status (Table-1). The seasonal variations was noted, water temperature was higher in summer and lowest in winter season. The lake water is generally alkaline. The observed pH was above 7.0 in all season. Water become clear during summer and thus transparency was higher during summer and lower during monsoon. The total dissolved solids of water ranges from 400.0-460.0 mg/lit. and recorded highest in monsoon season and lowest in winter season. The alkalinity of water ranges between 135.0-170.0 mg/lit. and was recorded highest during winter (George, 1992). Dissolved oxygen



range between 7.0-8.0 mg/lit. The values of calcium and magnesium are in acceptable range 42.0-56.0 mg/lit. and 15.0-24.0 mg/lit. sulphate and nitrate values are also in acceptable range i.e. 0.18-0.20 mg/lit. and 15.0-24.0 mg/lit. The phosphate of water ranges between 2.0-4.0 mg/lit. (Table-2 and Fig.-1)

Table. 1- List of some pollution indicator phytoplankton’s species from Sakkardara Lake

Sr. No.	Phytoplankton	Monsoon Season	Winter Season	Summer Season
1	<i>Microcystisaeruginosa</i>	-	+	+
2	<i>Oscillatoria species</i>	-	+	+
3	<i>Nostoc species</i>	+	+	+
4	<i>Anabaena species</i>	+	+	+
5	<i>Spirogyra species</i>	+	+	+

Table.2-Physico-chemical characteristics of water from Sakkardara Lake during 2012-13.

Sr. No.	Parameters	Monsoon season	Winter season	Summer season
1	Water temperature	25.0	19.5	30.0
2	pH	7.4	7.1	7.5
3	Free CO ₂ mg/lit.	-	-	-
4	Transparency	50	70	95
5	Total alkalinity mg/lit.	135.0	170.0	140.0
6	Total dissolved solids mg/lit.	460.0	400.0	430.0
7	Calcium mg/lit.	50.0	56.0	40.0
8	Magnesium mg/lit.	19.0	24.0	15.0
9	Nitrate mg/lit.	20.0	24.0	15.0
10	Phosphate mg/lit.	2.0	3.2	4.0
11	Sulphate mg/lit.	0.20	0.18	0.14
12	Dissolved oxygen mg/lit.	7.2	7.5	7.9

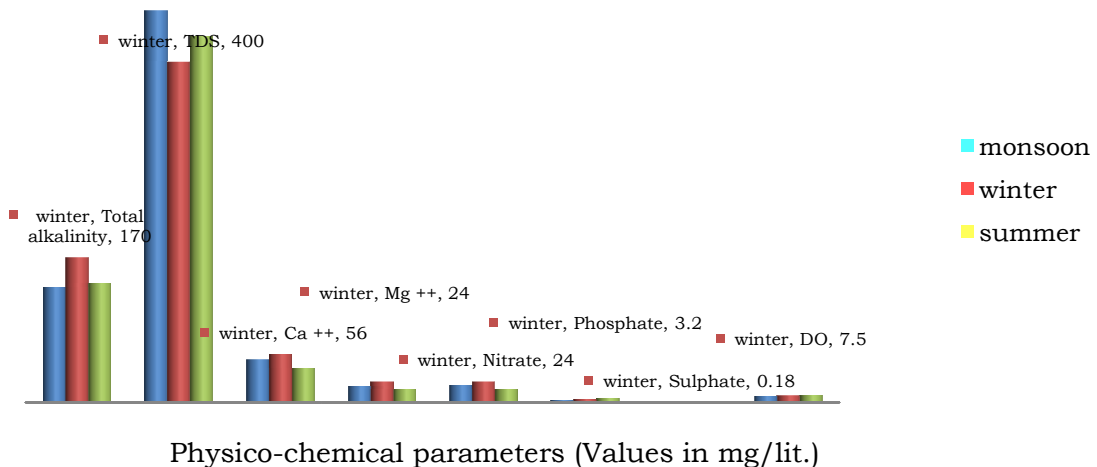


Figure. 1- Graphical representation of physico-chemical parameters of Sakkardara Lake water



Conclusion:

It may be concluded that the variation in physico-chemical parameters are responsible for the fluctuation in the pollution indicator species diversity of the Sakkardara Lake. All species are reported to be the most important indicators, as they receive the full impact of the habitat and are effective to assess the changes cause by anthropological activities and lake water body converted in to semieutrophic.

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