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Limnological Study of Fresh Water Makrera Lake Near Beawar, Ajmer, Rajasthan

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ABSTRACT: The Makrera lake was characterized by low levels of dissolved oxygen with average value of 7.1mg/l. The highest oxygen value of 8.5mg/l was observed in winter season. The peak value during winter was also observed. Dissolved oxygen shows a significant negative relation with temperature, alkalinity, total hardness, electrical conductance, nitrate, phosphate, chloride, silicate and respiration. The observed high value of dissolved oxygen in winter due to the high solubility at low temperature and less degradation of organic matter. During the study, the highest value of total alkalinity was in summer (590mg/l) and lowest value was observed in winter (410mg/l). Total alkalinity shows a positive relationship with temperature, pH, total hardness, TDS, conductivity, chloride and nitrate. The average value of total hardness during the study was lowest value of 315 mg/l and highest value of 375mg/l. Limnological parameter plays a key role in determining the ecological biodiversity. Planktonic diversity can be considered as a major key factor for determining the portability of water. Makrera Lake has the greatest importance amongst the localised. With a seasonal survey, the specific status of limnological characteristic and planktonic diversity in Makrera Lake have been studied through different weather cycles near Beawar, Rajasthan and in contact with human population over top and bottom water samples. The lake shows eutrophication.

KEYWORDS: Makrera lake, season, ecological biodiversity, freshwater, Beawar, eutrophication, Rajasthan

I.INTRODUCTION

Makrera is a small village of 1915 hectares in Peesangan Tehsil in Ajmer district in the State of Rajasthan, India. The village is administrated by a sarpanch who is elected representative of the village by the local elections. Makrera depends on Ajmer, the nearest town for all major economic activities. The village has government-provided water facilities that include One tap, One Well supply, which is 197.30% of the total supply, Two tanks, Two tubewells, and One handpump. The villagers also acquire water from some of the natural water sources - Two rivers, Two canals and Two springs. Makrera is also surrounded by Two lakes. The population of the village depends on the source of drinking water during summer on Handpump. Makrera's pin code is 305206 and village code is 02513100.[1,2] The area of Makrera is segregated as 254 hectares irrigated area, 966.13 hectares unirrigated, the 196.07 hectare area under culturable waste (including gauchar and groves), and remaining 489.87 hectare area not available for cultivation. The lake is situated here named Makrera lake provides water to agriculture. According to a census 2011 report, 1479 people of the total population are employed. The workforce is 778 male, 701 female with 864 (58.42%) of all workers being employed full-time, this includes 563 males and 301 females. 205 males and 112 females are considered as the main cultivators with the help of 81 male and 95 female agricultural labor. 615 people are reported to work for a marginal period of time in the year.

They depend on the agricultural markets (Mandi) of the nearby towns of Ajmer to sell agricultural produce and make their living. Hence Makrera lake is an important lake for farmers for cultivation. Limnology is the study of the physical, chemical, geological and biological aspects of all naturally occurring fresh water. Freshwater habitats such as lakes, ponds, dams, reservoirs are known as lentic (still) while running water such as rivers, mountain streams are known as lotic (flowing). Limnological studies of such water bodies reveal interaction of parameters influencing the productivity of the aquatic ecosystems. Due to rising human population and industrialization, the per capita water needs have increased to a great extent. The lentic water resources such as ponds, tanks and lakes, situated near human settlements,

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are getting polluted as they constantly receive solid and liquid wastes. However, much information is needed particularly with reference to specific water bodies of small dimension. In India, a number of ponds, lakes and reservoirs are naturally found but they are not being utilized properly due to lack of insufficient study of their limnology. The study of different water parameters is very important for understanding the metabolic events in the aquatic ecosystem. One of the most important features of ponds is the presence of standing water, which naturally provides habitat for wetland biota including both plants as well as animals. A large number of micro-organisms and invertebrates feed on the decaying plants and these micro-organisms and invertebrates in turn provide food for wetland species including fishes.[3,4]

For Makrera lake near Beawar, observations were made for water temperature, transparency and pH at the site, while for rest of the parameters, analysis was made in the laboratory as per standard procedures of APHA. . Planktonic flora and fauna were collected from marginal and centre of lake using plankton net following standard procedures and later identified in the laboratory.

Transparency describes how easily light can pass through a substance. In lake this means how deep sunlight penetrates through the water. Plants and algae need sunlight to grow, so they are only able to grow in areas of lakes where the sun light penetrates. Water transparency depends on the amount of particles in the water. The more particles mean the less water transparency. The water transparency is measured with a Secchi disk. The transparency of water body is affected by several factors like planktonic growth, rainfall, sun's position in the sky, angle of incidence of rays, cloudiness, visibility and turbidity due to suspended inert particulate matter. In the present investigation, the maximum value was recorded in summer and minimum value was recorded in monsoon. Low value of transparency in monsoon may be due to influx of rain water from catchments area, clouding, less penetration of light and high turbidity due to suspended inert particulates matter. However, high value of transparency in summer may be due to clear atmosphere and high light penetration[5,6]

II.DISCUSSION

The results of macro algae, phytoplankton and zooplankton populations in the Makrera lake indicate that the water of this lake is not yet seriously polluted since it contains freshwater algae *Chara* and *Nitella* and phytoplankton *Volvox* in the central region of lake. Most other plankton also comprised of non-indicator organisms. During the present study, presence of *Chlorella*, *Oscillatoria*, *Anacystis*, and *Scenedesmus* is considered as indicator of organic pollution because all these genera were collected from polluted marginal water. Makrera lake suggest its nutrient rich status and because of small size it could be gainfully used for fish culture. Authors suggest appropriate care of this lake in order to maintain the proper water level of surrounding areas. Thus based on the findings it can be concluded that the lake water was not suitable for bathing and drinking but it can be used for fish culture.[7,8]

In the present study, water turbidity values ranged from 0.5 to 10.5 NTU . High turbidity values were found in rainy season . The results showed high turbidity during rainy season. During rainy season silt, clay and other suspended particles contribute to high turbidity values, while during winter and summer seasons settlement of silt, clay results low turbidity. nd upon the water for irrigation and domestic purposes. This lake is surrounded on all sides by plants and large growth of phytoplankton and water hyacinth . Plankton plays a crucial role in aquatic food web because they are important food for other invertebrates and fishes which graze heavily on micro algae and other invertebrates. Plankton communities are highly sensitive to environmental changes. The consequent alteration in their density and species diversity can give important indications of environmental changes. Freshwater constitutes one of the important aquatic biomes for these potential groups of which phytoplankton forms the major source of primary production, while zooplankton serves as an important principal link between primary producers and higher forms. Further, as plankton forms an important component of fish food, the knowledge in its abundance, composition and seasonal variations is considered to be an essential prerequisite for successful fishery management. The estimation of plankton analysis helps in explaining the cause of color, turbidity, presence of odour, taste and visible particles in water. The organisms

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occurring in the aquatic ecosystem are under great influence of its physico-chemical properties. Thus, the qualitative and quantitative studies of plankton are an important factor to access the water quality.[9,10]

III.RESULTS

The food chain in Makrera Lake Ecosystem is often very simple comprising phytoplankton and aquatic vegetation as primary producers, zooplankton as primary consumers, small fishes as secondary consumers and large fishes as tertiary consumers. Plankton is the most sensitive floating community which is being the first target of water pollution, thus any undesirable change in aquatic ecosystem affects diversity as well as biomass of this community. The measurement of plankton's productivity helps to understand conservation ratio at various trophic level and resources as an essential input for proper management of lake. The plankton samples were collected from the surface in littoral region of lake. Plankton net having bolting silk cloth (mesh size 55 μ) was used for collection of samples. Appropriate quantity of water (50 liters for water) was measured in a graduated bucket and filtered through the net. Planktons thus obtained were preserved in 4% neutralized formalin for further quantitative and qualitative analysis. Sedgwick Rafter plankton counting cell was used for qualitative and quantitative analysis of plankton. [11,12] Concentrated samples of planktons were transferred on the counting sell by using 1 ml plankton pipette. Plankton were identified and counted by moving the Sedgwick Rafter cell under the microscope. The total number of phytoplankton counted in each sample was multiplied with dilution factor and results were expressed in cell ml⁻¹ for phytoplankton . The qualitative analysis of phytoplankton was done following the standard methods . The identification of phytoplankton was restricted only up to major Groups viz. Cyanophyceae, Chlorophyceae, Bacillariophyceae and Desmidiaceae[13]

CONCLUSIONS

The algal flora of lake Makrera was contributed by four categories viz Cyanophyceae, Chlorophyceae, Bacillariophyceae, Desmidiaceae. Over 35 genera of phytoplankton were recorded in Lake Makrera. Out of this 11 were from Cyanophyceae, 9 were from Bacillariophyceae, 12 were Chlorophyceae and 3 were belongs to Desmidiaceae. However phytoplankton community of water body was represented by 6 groups namely Chlorophyceae, Bacillariophyceae, Cyanophyceae, Xanthophyceae, Myxophyceae and Dinophyceae. On the basis of water quality parameters in general, Lake Makrera was found to be eutrophic with a rich number of species and biodiversity of aquatic animals. The authors also reported a high rate of primary production (302.085mgc/m² /hr) and diversity of phytoplankton (58 forms), zooplankton (104 forms) and fish (15 species) observed during the study period. Authors have suggested that algal flora of a lake ecosystem is a reliable indicator of water pollution as it is justified in present study. [14] The study explains that lake Makrera as a rich biodiversity of plankton, with a dominance of Chlorophyceae, assigning eutrophic status of lake. The study it is recommends that a sustainable management plan should be formulated and implemented in order to conserve diverse ecosystem of Lake Makrera near Beawar, Rajasthan.[15]

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