

# A review on eutrophication and the water quality of Bicherli pond in Beawar city

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## **INTRODUCTION:**

Bicherli pond is struggling with eutrophication—a process where excessive nutrients cause an explosion of plant life that "suffocates" the water. Water Hyacinth (*Eichhornia*) is present tremendously in the pond, it isn't just a weed; it's a biological indicator of the city's failed sewage management. Phosphorus and Nitrates from household detergents and sewage act as "super-fertilizers." This leads to a thick green carpet that blocks sunlight, killing the oxygen-producing phytoplankton underneath.

According to a preliminary study, 42.4 per cent of potable water in villages in western Rajasthan has relied on Nadi, 34.7 per cent on Tanka, 15.0 per cent on wells and tube-wells and 7.8 per cent on other supplies (Narain, Khan & Singh, 2005). Ruthless exploitation of the water resources have made it polluted. Extensive migration of rural population to cities has led to rise in utility services that ultimately resulted in misuse of water resources. Other than expanding population, industrialization is also responsible for about a 4 % rise in water demand annually resulting in a substantial increase in industrial wastewaters volume (B.B. Makut 2019). It is estimated that the total water demand for domestic, industrial and agricultural sectors will rise to 103 billion cubic meters (BCM) in 2025 and 1447 BCM by 2050 (B.B. Makut 2019). Considerable limnological investigations are carried out on manmade impoundments in India ( Surendra Kumar & Sharma (1991), Bahura (1998), Shastri and Pendse (2001). Limnological studies on ponds in Rajasthan have been carried out by many workers. However the water quality parameters, zooplanktons and phytoplankton in Bicherli pond of Beawar city, Ajmer district and the impact of pollution on it remained less explored.

Photosynthetic phytoplankton and among consumers mainly the zooplanktons play an important role in the food web of an aquatic system. The flora and fauna are profoundly affected by pollution. Pollution may selectively stimulate the growth of a few types of phytoplankton and than in turn reduces the water quality and affects its use. Considering the above facts, the present research work was undertaken. In this research work study of the flora and fauna along with other physico-chemical parameters was done from July 2022 to July 2023.

## **MATERIAL AND METHOD:**

A composite water sample was collected from two different sites. The water sample was collected monthly during the study period that included monsoon and post monsoon seasons. The collection of planktons was made by filtering 40-50 liters of water through planktonic net with a pore size of about 60 um. Samples in the laboratory were immediately preserved in Lugols solution and stored in dark. The samples were observed under microscope. A general periodic counting of phytoplanktons collected from two sites belonging to 4 groups (Chlorophyceae, Cyanophyceae, Bacillariophyceae and Euglenophyceae) was done. Sedgwick Rafter plankton counting cell was used for qualitative and quantitative analysis of plankton. (Shrivastava N. P. et.al 2002, Somani V. et.al 2007) The phytoplanktons were identified through their taxonomical features with the help of books, monographs.

**OBSERVATIONS AND RESULTS:**

The **phytoplankton** diversity observed at different sampling stations is mentioned below. Phytoplanktons are represented as Chlorophyceae, Cyanophyceae, Bacillariophyceae and Euglenophyceae. Occurrence of phytoplanktons at the two sampling stations is as follows:

**Chlorophyceae**

*Coelastrum cambricum*, *Oocystis olitaria*, *Oocystis natans*, *Tetraedron minimum*, *Chlorococcum infusionum*, *Pediastrum borryanum*, *Pediastrum duplex*, *Pediastrum ovatum*, *Scenedesmus quadricauda*, *Scenedesmus quadricauda*, *Scenedesmus incrassatulus*, *Scenedesmus acutus*, *Spirogyra rivularis*, *Spirogyra weberi*, *Spirogyra nitida*, *Chlorella vulgaris*, *Ulothrix aequalis*, *Closterium lunula*, *Closterium ehrenbergii*, *Cosmarium spp*, *Cosmarium quadrum*, *Chlamydomonas reinhardi*

**Cyanophyceae**

*Calothrix stellaris*, *Lyngbya lachneri*, *Lyngbya birgei*, *Lyngbya borgeti*, *Lyngbya heironymusii*, *Oscillatoria substissima*, *Oscillatoria curviceps*, *Oscillatoria terebriformis*, *Anabena khannae*, *Anabena beckii*, *Fragillaria sp.*

**Bacillariophyceae**

*Navicula scoliopleuroides*, *Navicula cryptocephala*, *Navicula plicata*, *Cymbella leptoceros*, *Nitzschia sublinearis*.

**Euglenophyceae**

*Euglena deses*, *Euglena oxyuris*, *Euglena gracilis*, *Euglena spirogyra*, *Phacus orbicularis*, *Phacus undulatum*, *Phacus caudatus*, *Phacus longicauda*.

**The zooplankton**

population was represented by members of Protozoa & Rotifera. Among Rotifera, *Asplanchna*, *Filinia*, *Lepadella*, *Brachionus* and *Keratella* species were the most abundant.

Rotifers: *Anuroopsis sp.*, *Ascomorpha sp.*, *Asplanchna sp.*, *Brachionus sp.*, *Conochiloides sp.*, *Euchlanis sp.*, *Filinia sp.*, *Gastropus sp.*, *Hexarthra sp.*, *Keratella sp.*, *Lecane sp.*, *Lepadella sp.*, *Lophocaris sp.*, *Testudinella sp.*, *Trichocerca sp.*, *Kellicotia sp.*, *Macrochaetus sp.*

Chydoridae: *Kurzia latissima*, *Leydigia leydigit*, *Monospilus sp.*

Macrothricidae : *Illicryptus sp.*

Daphnidae: *Ceriodaphnia sp.*, *Daphnia sp.*, *Scapholeberis sp.*

Some species of Sididae, Bosminidae were also found in the samples so collected.

Other than the above the samples also tested positive for the presence of *E.coli*. It was found that water is highly contaminated due to the presence of *E.coli* in abundance. It was found that not only *E.coli*, water also contained large number of larvae of mosquitoes and flies. A noticeable number of Blood worms also known as Red worms were also identified in the water sample.

Chironomous Larvae or Red Worms from the Dipterans group: These are the larval stage of non-biting midge flies. These harmless, tiny larvae thrive in low-oxygen, high-organic waste and are often eaten by fish. Their presence indicates that water is highly polluted. These species are tolerant to the organic pollution and found in abundance in sedimentation areas. (Central Pollution Control Board, New Delhi, 2010)<sup>15</sup>



Chironomous Larva- Red Worm

The water quality was analyzed on the basis of various parameter (APHA et al., 1989). The observations (in ppm) from site A and site B (average of the total) are as follows:

Environmental variables	Site A	Site B
Total alkanity	220 ppm	299 ppm
Chloride	142 mg/l	239.1 mg/l
Total Hardness	170 ppm	294.4 ppm
Free Carbon di Oxide	16.2 mg/l	30 mg/l
Dissolved Oxygen	3.83ppm	3.95 ppm
pH	7.5	8.2
(TDS) Total Dissolved solids	500.45 mg/l	512 mg/l

Temperature was recorded at the site (at time of sample collection) that varied between 17. 1<sup>0</sup> C to 40.2<sup>0</sup> C. Water turbidity values ranged from 2.3 to 10.5 NTU. High turbidity values were found in rainy season.

**CONCLUSIONS:**

Presence of species of *Brachionus*, *Asplanchna* and *Tesdinella*, indicates eutrophicated status of the pond, as also reported by Tripathi and Ghosh, 2004. (Bahura, R. 1998; Sindhu, 1991; Lubana, 1991) reported *Asplanchna sp.* in polluted pond of Jodhpur. This species flourished even when conditions caused by the pollution were the most stressful, viz. low dissolved Oxygen and pH. As such, this rotifer appears to be a biological indicator of saprobic condition of water. Sampath *et al.*, (1979) also regarded rotifers as biological indicators of water quality in Cauvery river. Nutrient availability influences the predominance of rotifers and copepods. Presence of *E. coli* and Blood worms detected in the water clearly points towards the contamination of water. It shows that the water is contaminated with human wastes which may carry disease germs and parasites. On the other hand, the water is alkaline and unfit for drinking as its pH was above 7.

Physico-chemical parameters and the presence of phytoplanktons *Oscillatoria*, *Scenedesmus*, *Anabena* and *Fragilaria* in the pond clearly indicated that the water is polluted. The excess nutrients promote growth of weeds and algae (e.g., Water Hyacinth), reducing dissolved oxygen and destroying aquatic life.

The study found that pond is rich in biodiversity of planktons, with a dominance of Chlorophyceae, assigning eutrophic status of lake which was also by reported by Sharma N. 2013. Among the zooplanktons the most abundant genera are *Brachionus*, *Filinia*, *Lepadella* that belong to phylum Rotifera.

Disposal of untreated waste from industries into water bodies, direct inflow of domestic sewage from growing urban areas into the pond, Idol immersion and waste disposal during festivals have caused severe degradation of water. Agricultural runoff and dumping of garbage and construction waste around pond edges are also equally responsible for the eutrophication of pond. The above all mentioned factors are responsible for changes in the phytoplanktons fauna and zooplanktons flora.

The research work was undertaken with the aim to highlight the issues seeking attention and consideration from policymakers to achieve efficient wastewater management in India, especially in

Rajasthan where there is scarcity of water. Western Rajasthan, a dry region in northwest India, faces severe water scarcity and industrial pollution. With less than 300 mm of annual rainfall and depleting groundwater (A.L. Gonçalves *et al.* 2017), a systematic strategy should be adopted to create awareness about waste-water management. WHO (2022) reported that over 2 billion people in the world live in countries that experience water scarcity. The availability of water is fast succumbing due to climate change and population growth. Hence developing and adopting strategies to re-use wastewater is the need of the hour. This will prevent ponds like Bicherli from dying –A “Green Death”

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