



THE STUDY OF PHYSICO-CHEMICAL PARAMETERS AND PHYTOPLANKTON DIVERSITY OF SUMMER SEASON, JEERAN POND, NIMACH (MADHYA PRADESH).

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Abstract: The current study employs physiochemical and biological characteristics, taking into consideration planktonic species, to investigate the phytoplankton diversity and Physico-chemical parameters of Jeeran ponds in the Nimach District(MP). The water sample has been collected from the three edges of the pond that is the starting point, middle point and end point of the pond during the spring and summer seasons. Palmer's Indices were used to determine the pollution levels in the ponds, and the physicochemical characteristics provided additional support. The physicochemical parameters such as pH, TDS, conductivity, EC, calcium, chlorides, phosphates, nitrates, bromides, and nitrites were related to the plankton evaluation (qualitative).

Keywords: phytoplankton, Physico-chemical analysis, jeeran pond.

1 Introduction: All living organisms depend on water in some way. Furthermore, it performs distinctive and crucial functions for the biosphere, ecology, and biogeochemical cycles of the earth. Freshwater shortages are now a global issue because of how quickly the quality of the available supplies is declining [1]. Five interrelated categories—overexploitation, water pollution, flow alteration, habitat destruction or degradation, and invasion by exotic species—can be used to classify the threats to the world's freshwater biodiversity [2]. Inland waterways, such as lakes (both freshwater and saltwater), reservoirs, rivers, streams, wetlands, and groundwater, are studied in limnology as natural systems that interact with their drainage basins and the atmosphere. In comparison to the most impacted terrestrial ecosystem, declines in biodiversity are much more pronounced in freshwaters [3]. To ensure that the water from these lakes is not exploited for drinking, a determined effort must be made to study their ecosystem. Locals use water for a variety of activities including bathing, laundry, swimming, and cleaning kitchen items. Water entering lakes from inlets also contains chemical fertilisers and insecticides, further contaminating the water. Since biological communities incorporate the environmental effects of river and lake water chemistry, biological evaluation is a valuable alternative for evaluating the ecological health of aquatic ecosystems [4]. The main production community is called phytoplankton, which mostly comprises algae-like diatoms, dinoflagellates, and other types from other plant

kingdom divisions. The essential foundation of an aquatic ecosystem's nutrient cycle is phytoplankton. They make up the majority of the food that fish, zooplankton, and other aquatic species eat. Numerous factors affect phytoplankton composition, and they all alter in response to ecological changes. Understanding the ecosystem's structure and dynamics depends on the biomass and community makeup of the phytoplankton [5]. Due to eutrophication, some of these lakes are already in danger of being extinct. Therefore, to prevent further degradation, these lakes require coordinated focus toward a thorough understanding of their environment. Determine the current status of phytoplankton diversity and water quality in Jeeran Pond. Research the impact of physicochemical parameters on phytoplankton population, species composition, and community organisation.

2 Material and Methods:

2.1 Study Area: Jeeran is located at 24.32°N 74.88°E. It has an average elevation of 1551 feet (473 metres). It is a part of the Malwa plateau. Jeeran has also a big pond from which people serve their needs.



Figure-1 Study area Jeeran pond, Nimach (Madhya Pradesh)

2.2 Collection of water samples:

The water sample has been collected from the three edges of the pond that is the starting point, middle point and end point of the pond in the morning between 8.00 am to 10.00 am regularly

2.3 Physico-chemical parameters:

Table-1 Physico-chemical parameters of pond

S.N.	Unit	Water parameters	Sample Data		
			Starting point of the pond	Middle Point of pond	End point of pond
1	NTU	Turbidity	20.3	13.1	26.7
2	pH scale	pH	7.47	7.20	7.19
3	s/cm	Conductivity	436	457	450

4	mg/l	TDS	279	297	288
5	mg/l	Fluoride as F	0.43	0.41	0.40
6	mg/l	Nitrate as NO ₃	0.97	1.08	1.17
7	mg/l	Sulphate as SO ₄	17.65	14.92	17.81
8	mg/l	Iron as Fe	0.13	0.11	0.15
9	mg/l	Manganese as Mn	0.00	0.00	0.00
10	mg/l	Arsenic	-	-	-
11	mg/l	Chlorine as Cl ₂	-	-	-
12	mg/l	Total hardness as CaCO ₃	104	108	100
13	mg/l	Calcium as Ca	25.60	25.60	22.40
14	mg/l	Magnesium as Mg	9.60	10.56	10.56
15	mg/l	Total Alkalinity as CaCO ₃	112	108	116
16	mg/l	Chloride as Cl	30	32	30

2.4 Phytoplankton diversity:

Table-2 Phytoplankton diversity of pond

S.NO.	Scientific name	Starting point of pond	Middle Point of pond	End point of pond
I	Family Bacillariophyceae			
1	Cyclotella sp.	+	-	+
2	Diatoma sp.	+	+	+
3	Fragillaria sp.	-	+	-
4	Navicula sp.	+	-	-
5	Synedra sp.	+	-	+
6	Nitzschia	+	-	-
II	Family chlorophyceae			
7	Cladophora sp.	-	-	-
8	Chlorella sp.	-	+	+
9	Closterium sp.	+	+	+
10	Cosmarium sp.	-	-	+
11	Coelastrum sp.	+	+	-
12	Netrium sp.	+	-	-
13	Pediastrum sp.	+	-	+
14	Spirogyra sp.	-	+	+
III	Family Cynophyceae			
15	Oscillatoria sp.	+	+	+
16	Rivularia sp.	+	-	+
17	Spirulina sp.	+	+	+

3 RESULTS AND DISCUSSION:

The Physico-chemical characteristics of Jeeran pond. water temperature ranges from 35.2⁰C to 39.5⁰C. The monsoon season saw the lowest temperature readings, while the summer months saw the highest. Water temperature has a significant impact on all metabolic and physiological activity as well as life processes in aquatic species, including eating, reproduction, migration, and distribution. Surface temperature closely

mirrored the temperature of the surrounding air. This is especially true for lakes and ponds, such as the ones in the current study [6].

The difference in sample times and the impact of the season may be to blame for the fluctuation in water temperature in this experiment and increased domestic sewage [7,8]. The observed pH values vary from 7.19 to 7.47. The pH value that was recorded was at its highest during the summer. High pH levels encourage the growth of algae and cause a significant phytoplankton bloom [9]. The photosynthetic rate, which demands more CO₂ than is supplied by respiration and decomposition, causes pH values above 8 in natural water.

Turbidity is the term for the suspension of particles in water that prevents light from passing through. The range of turbidity values is 13.1 to 26.7 NTU. The summer season had the highest value. The results are consistent with those of Jain [10] and Verma et al. [11]. The highest turbidity levels during the summer are possible as a result of rainfall and surface runoff of water transporting numerous sediments from the neighbourhood.

The EC varies between 436 and 457 S/cm. In contrast to poor conductivity during the monsoon season, high conductivity was found during the pre-monsoon season. The salt in the water and the current they produce are what cause the EC in the water. The ion concentration, nutritional status, and fluctuation in soluble solid content all affect the conductivity of water. Numerous researchers reported similar findings [12,13]. Due to plant death and deterioration, water levels drop in the summer.

TDS are the solids that are dissolved in water and are therefore present. TDS varies between 279 and 297 mg/l. Low amounts of TDS were observed during the post-monsoon season, however, substantial amounts were recorded throughout the summer season. The majority of the dissolved solids in natural water are carbonates and bicarbonates of minerals like calcium, magnesium, sodium, potassium, iron, and manganese, among others. TDS mostly refers to the different types of minerals that are present in the water. The addition of home wastewater, trash, sewage, and other materials to the natural surface water body during the summer may be the cause of the high TDS value [14].

A crucial indicator for identifying sewage contamination was the chloride concentration. Chloride concentrations range from 0.97 mg/l to 1.97 mg/l. One of the main inorganic anions in water is chloride concentration, which takes the form of chloride ions [15]. In general, it happens in sewage, irrigation waste, and industrial effluent discharges [16]. The chloride concentration showed significant seasonal change, peaking in the summer and declining in the monsoon season, which is consistent with the findings of Cl [17,18].

Nitrate concentrations range between 30 mg/l and 32 mg/l. Nitrate concentrations peaked throughout the monsoon season and fell off during the post-monsoon season. Sewage discharge, industrial waste, and runoff from agricultural areas all contribute nitrates to fresh water. [19] The reason for the higher concentration could be the entry of sewage-filled, nitrogen-rich floodwater. The highest nitrate-nitrogen concentration, which is known to support the production of blooms, was observed during the monsoon season [20].

4 CONCLUSION:

The findings indicate that Jeeran pond Nimach is somewhat contaminated and that eutrophication is trending upward. Orthophosphate and nitrogen abundance were favourable for phytoplankton growth. Cyanophyceae dominance in the summer and pre-monsoon seasons, Chlorophyceae as the second dominant species in the pre-monsoon, Bacillariophyceae in the summer season, and Euglenophyceae in the post-monsoon season all show clear seasonal fluctuation in phytoplankton distribution. Cyanophyceae algal growth was discovered to be dominant over Chlorophyceae, Bacillariophyceae, and Euglenophyceae during the investigation. The majority of the leading phytoplankton species were not regarded as being toxic or dangerous to human health. It is

recommended that the proper maintenance of the water bodies is necessary. Proper sanitation measures and environmental education for public care are essential to keep these water bodies clean and safe. A few efforts like diversion of sewage, and presentation of leaching of nutrients from catchment areas through plantations would yield a healthy hygienic and sustainable environment.

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