

Original Research Article

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Water Testing and Phytoplankton Diversity in Talwada Pond in West Nimar District Barwani, (M.P.), India

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ABSTRACT

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Water is the source of all life. Water quality has been linked to survival of life across the world. The study evaluated the physicochemical parameter that linked to plankton diversity. Plankton is weakly swimming but most drifting small organism that inhabits the water column of ocean and bodies of fresh water. Phytoplankton is the free floating more or less drifting plant communities in the Reservoir. Phytoplankton could be used as the indicator of physicochemical status of any water body. The present investigations were carried out to study the biodiversity of Phytoplankton in Talwada reservoir of West Nimar (M.P.) during January 2022 to December 2023. Altogether 35 species of phytoplankton were observed including 18 Chlorophyceae spp., 8 Bacillariophyceae spp., 8 Cyanophyceae spp. and 1 Euglenophyceae spp, respectively. 8 Bacillariophyceae species were observed in abundant. Correlations of water quality parameter and phytoplankton biomass were evaluated. Phytoplankton diversity directly affects the fish productivity in Talwada Pond.

Introduction

Water is one of the prime necessities of life. We can hardly live for a few days without water. In a man's body 70% is the water. Blood, cells and bones contain 18%, 75% and 22% water respectively (Baruah, *et al.*, 2012; Frost and Culver, 2001; Abrehet, *et al.*, 2022).

Water is an essential commodity for the development of industries, agriculture and fisheries. Water is the source of all life. It nourishes plant life and rich variety of aquatic animals (Saha and Choudhary, 1985; Zafar, 1986).

Water is a prime need for human survival and industrial

development (Kagalou, *et al.*, 2003). Since time immemorial fresh water has always been of vital importance to man as his early habitations were within easy reach of rivers, tanks, dams, ponds and lakes (Juday, *et al.*, 1924; Nair, *et al.*, 1988; Nath, 2001; Kagalou, *et al.*, 2003).

The importance of fresh water resources, their conservation and utilization has attained utmost importance in the present time.

Evaporation of water from ocean, cloud formation and precipitation are responsible for worldwide water circulation through hydrological cycle (Juday, *et al.*, 1924). Life was first originated in water; and it is one of

the primary necessities of living and nonliving cycles occurring in the universe.

Water is used in every part of day to day life. Naturally conserved surface water is a habitat of wild life and to the general people its recreational aspects are also important apart from drinking water.

Planktons are the weakly swimming but mostly drifting small organisms that inhabit the water column of ocean and bodies of freshwater. The name comes from the Greek term, plankton-meaning 'wanderer' or 'drifter'.

1. On the basis of quality, the plankton can be grouped as phytoplankton i.e. plant plankton. They are phytoplankton proper, the chlorophyll bearing plants and saproplankton including Bacteria and fungi. The other group includes zooplankton or animal plankton.
2. On the basis of local environmental distribution, plankton can be classified as limnoplankton or lakeplankton, rheoplankton (potamo plankton):- The running water plankton, heleoplankton the pond plankton, haliplankton – the salt water plankton and hypalmyroplankton – the brackish water plankton.
3. The phytoplankton's play a phenomenal role in the biosynthesis of organic material. While zooplankton, an important components of secondary production, provides a link between the producers and secondary consumers.

Materials and Methods

Talwada tank is permanent pond in the present study. This pond is situated at Talwada village. This is located on Barwani - Rajpur road 17 km away from the Barwani town.

The geographical position of the pond is 21°58'15" latitude and 74°47'42" longitude. water testing carried out by standard methods as described by [Trivedi and Goel \(1986\)](#); [Prescott, 1951](#); [APHA \(2017 and 2023\)](#).

The water sample for identification and enumeration of phytoplankton were collected separately in wide mouth and bottles with the help of plankton net 55um in size

with amount of pond water and immediately preserved in 4 % formalin solution as followed by [Singh \(1997\)](#).

The identification of phytoplankton was carried out by following standard literature ([Vyas, 1968](#); [Vaishya, 1990](#)). Phytoplankton count was done by using Sedgwick Rafter plankton count cell by standard method ([Rehan, et al., 1995](#)).

Results and Discussion

The complicated system in an aquatic environment constitutes two main aspects viz. Physicochemical and biological, both the aspects are significant in monitoring the water quality, but the physicochemical conditions are of primary concern. Physico-chemical parameter estimated as minimum and maximum.

The air temperature 20°C to 35°C, the water temperature 18°C to 33°C, transparency ranged from 11 c.m. to 34 c.m, pH 7.4 to 8.5, alkalinity ranged between 70 mg/liter. to 200 mg/liter, the dissolved oxygen of Talwada tank ranged between 10 mg/liter to 10.7 mg/liter, BOD values ranged from 7 mg/liter to 8.2 mg/liter, the free carbon dioxide values varied between 2.25mg/liter to mg/liter, chloride content fluctuated between 8.6 mg/liter to 18.2 mg/liter phosphate ranged between 0.58 mg/liter to 2.12 mg/liter, sulphate ranged between 35.5 mg/liter to 132mg/liter, nitrate of Talwada tank ranged between 0.18 mg/liter to 0.98 mg/liter.

In the present study the phytoplankton population was found to be comprising of four major group viz. Chlorophyceae, Bacillariophyceae, Cyanophyceae and Euglenophyceae. In the present investigation 35 species of phytoplankton have been recorded of which 18 belonged to Chlorophyceae, 8 to Bacillariophyceae, 8 to Cyanophyceae and 1 to Euglenophyceae respectively. The total phytoplankton recorded at this tank was 3779 No/liter.

Bacillariophyceae contributed 43.97% to the total phytoplankton. The density of this group ranged between 67 No/liter to 296 No/liter. Eulenophyceae contributed 2.40% to the total phytoplankton. The population density oscillated between 10 No/liter to 48 No/liter.

Table.1 Annual fluctuation in physicochemical parameters of the water of Talwada Tank (2022-23)

S.N	Parameter	Jul.	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Ma.	Apr	May	Jun	Max	Min	Mean
1	Air Temperature	28	29	32	32	29	25	31	21	30	36	Dry	Dry	36	21	28.5
2	Water Temperature	26	28	27	25	24	20	20.5	19	28	34			34	19	26.5
3	Transparency	14.5	10	15.2	25	24.4	26	30	20.2	22	32.5			32.5	10	21.25
4	pH	7.4	7.3	7.4	7.6	8	7.9	8.3	8.2	8.3	8.4			8.4	7.3	7.85
5	Alkalinity	70	72	92	110	115	150	190	205	180	165			205	70	137.5
6	Dissolved Oxygen	9.4	10.3	10.4	10	10.2	10.5	10.4	10.6	10.4	10.4			10.6	9.4	10
7	BOD	7.2	7.2	7.4	7	7	7.9	8	8	8.2	8.2			8.2	7	7.6
8	Free Carbondioxide	2.32	3.68	3.42	4.1	4.92	4.52	4.28	3.85	2.89	2.1			4.92	2.1	3.51
9	Chloride	10	18	14	16	14.8	16.8	15	17.2	18.5	19			19	10	14.5
10	Phosphate	0.92	1	0.62	1.2	1.05	1.12	1.82	1	1.65	1.95			1.95	0.62	1.28
11	Sulphate	38	34	58	70	75	80	79	85	100	102			102	34	68
12	Nitrate	0.52	0.54	0.65	0.2	0.25	0.65	0.82	0.83	0.75	0.79	Dry	Dry	0.83	0.22	0.52

Figure.1

Annual fluctuations in physicochemical parameters of the talwada tank (2022-2023)

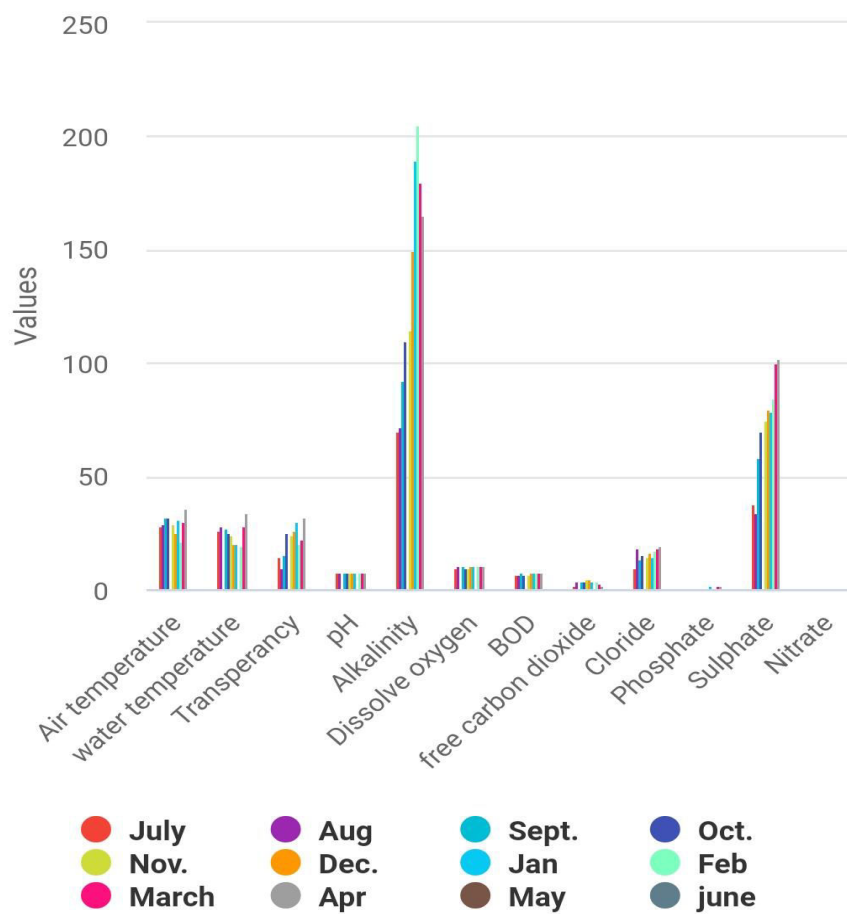
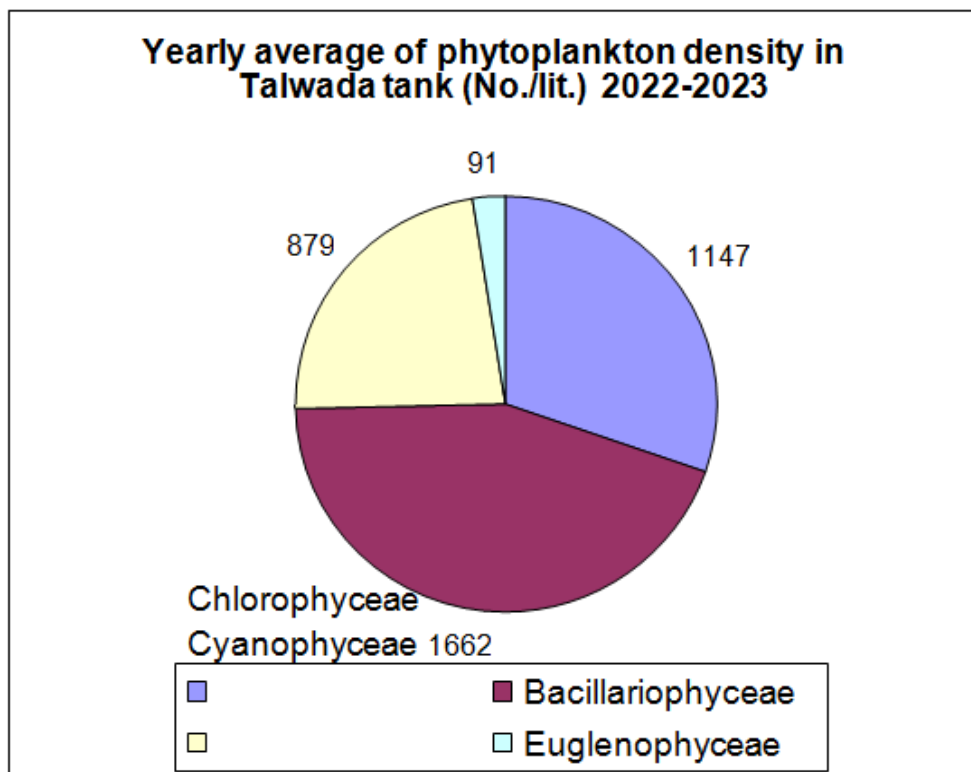


Table.2 Monthly variation in phytoplankton density in Talwada tank (No./lit.) 2022-2023

S.N.	Name of group and species	07	08	09	10	11	12	01	02	03	04	05	06	Annual Total	Status
Chlorophyceae															
1	Ankistrodesmus sp.	5	5	2	5	10	12	19	20	21	0	Dry	Dry	99	C
2	Chlamydomonas sp.	0	12	0	0	8	9	22	12	5	0			68	C
3	Chlorella sp.	4	4	8	8	12	19	22	8	6	2			93	C
4	Chaetophora sp.	0	5	0	12	14	5	0	0	12	0			48	R
5	Closterium sp.	15	16	8	0	0	0	6	12	7	0			64	C
6	Gonium sp.	2	3	0	7	20	5	13	19	0	0			69	C
7	Mougeotia sp.	13	14	20	25	0	0	0	0	0	21			93	C
8	Oedogonium sp.	9	2	0	2	15	18	31	0	18	0			95	C
9	Pandorina sp.	15	0	5	0	0	3	6	21	16	21			87	C
10	Pediastrum sp.	0	20	4	10	20	30	40	37	30	0			191	A
11	Scenedesmus sp.	9	12	25	61	44	32	48	16	17	10			274	A
12	Spirogyra sp.	6	5	4	0	0	10	6	6	2	0			39	R
13	Volvox	4	0	8	16	21	26	24	0	0	2			101	A
Total species		82	98	84	146	164	169	237	151	134	56	Dry	Dry	1321	
Bacillariophyceae															
1	Amphora sp.	0	0	0	0	0	32	20	45	38	17	Dry	Dry	152	A
2	Diatoma sp.	9	11	15	0	0	0	12	15	18	20			100	A
3	Frugilaria sp.	21	16	10	22	27	32	51	12	0	0			191	A
4	Frustulia sp.	0	40	49	52	0	0	0	16	27	30			214	A
5	Synedra sp.	29	12	13	68	10	32	9	17	2	24			216	A
6	Pinnularia sp.	5	6	12	11	16	17	0	0	4	12			83	C
7	Tabellaria sp.	10	10	32	45	135	75	45	0	0	0			352	A
8	Novicula sp.	8	0	0	0	18	20	0	0	7	12			65	C
Total species		82	95	131	198	206	208	137	105	96	115	Dry	Dry	1373	
Cyanophyceae															
1	Anabaenopsis sp.	0	13	27	31	0	0	0	17	26	12	Dry	Dry	126	A
2	Aphanizomenon sp.	0	8	0	0	20	15	0	18	20	20			101	A
3	Nostoc sp.	0	0	0	0	12	12	0	8	10	10			52	R
4	Spirulina sp.	75	52	3	0	0	0	8	7	40	10			195	A
5	Oscillatoria sp.	0	0	20	15	32	45	20	54	0	60			246	A
Total species		75	73	50	46	64	72	28	104	96	112	Dry	Dry	720	
Euglenophyceae															
1	Euglena sp.	32	30	0	12	0	34	68	0	0	0	Dry	Dry	176	A
Total species		32	30	0	12	0	34	68	0	0	0	Dry	Dry	176	

Figure.2



Fish Farming has been an old occupation in India. The result from this study revealed that physiochemical parameters can positively support the population of fresh water phytoplankton with correlation between the total dissolved solids, pH, temperature, plankton and fish diversity.

The impact of fish production in the rural area is very much seen in the economic condition of the people. This study is helpful for fish farming will encourage not only the economic development of the people but also a good social life.

Author Contributions

Chouhan Pushpa: Investigation, formal analysis, writing—original draft. Jambholkar Sandeep: Validation, methodology, writing—reviewing.

Data Availability

The datasets generated during and/or analyzed during the

current study are available from the corresponding author on reasonable request.

Declarations

Ethical Approval Not applicable.

Consent to Participate Not applicable.

Consent to Publish Not applicable.

Conflict of Interest The authors declare no competing interests.

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