

Seasonal variation of physico-chemical parameters and their impact on phytoplankton in Dholawad dam at Ratlam (M.P.)

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Abstract

Water is most important for life aquatic living depends on the physico-chemical characteristics of water like algae. Population and distribution of algae is greatly affected by physico-chemical properties of water. Present paper represents the physico-chemical and biological property of property of Dam water. Water samples were collected from restricted sites of Dholawad Dam from three different seasons and analyzed physico-chemical parameters in botany lab. Algal sample were collect to the surface of water and 50 liter water passed through standard plankton net collecting phytoplankton. The identification of phytoplankton was done with standard books and monographs. During the work over all 36 genera of phytoplankton were reported at the Dholawad Dam. 14 genera belonged to Chlorophyceae, 13 genera belonged to Bacillariophyceae and 9 genera from Cynophyceae. The algal population showed the abundance in winter and summer.

Keywords: water, physico-chemical, Dholawad, abundance, winter

Introduction

Water is most important for life 70% earth covered by water. Aquatic living depends on the physico-chemical characteristics of water like algae. Physico-chemical parameters rule all aquatic ecosystems. Water is home of algae, some algae found as free floating on the surface of water are called Phytoplankton. Algae are producer in food chain in aquatic system, Sharma *et al.* (2013) [10]. Their population and distribution is greatly affected by physico-chemical properties of water (Sharma and Diwan, 1997) [9]. Some of algal genera increase in polluted waters it's called pollution tolerant forms or pollution indicator. Plankton is of extremely importance in the freshwater ecosystem as they having a very high nutritive value (Mishra and Joshi 2003) [6]. The fresh water phytoplankton predominantly belongs to Chlorophyceae, Bacillariophyceae and Cyanophyceae, Biswas (1936) [2].

Productivity of plankton depends on environment created by physico-chemical parameters when Cyanophyceae was dominant in summer season as reported by Sharma (2018). Vats *et al.* (2018) [14] recorded maximum productivity of phytoplankton in winter season in Ganga River at Haridwar. Dixit and Sharma (2019) [3] reported the Chlorophyceae as dominant over Bacillariophyceae while assessing the pollution status of the river Gomati River at Lucknow. Dholawad dam will provide information on seasonal change in abundance of phytoplankton under different climatic conditions and give an understanding about the survival of different livings.

Materials and Methods

Study area

Dholawad Dam situated at Distinct Ratlam (M.P.) on the river Jamad. Dholawad Dam is situated in a rural area of Ratlam district. Geological coordinate of Dam are 23° 16' N latitude and 74° 54' E longitude. The Dam constructed at river Jamad which is a tributary of Mahi River. Present

paper represents the physico-chemical and biological property of property of Dam water.

Sample Collection

Water samples were collected from the dam's restricted sites in three different seasons from January 2020 to December of the year 2020. Samples were collected in two 250ml plastics bottles, one for DO were recorded immediately and second bottle for used for other physico-chemical parameters testing in botany lab. Water sample analyzed following method of APHA (2002) [1]. Algal samples were collected with a plankton net made of bolting silk cloth of 14 (120 μ) and 25 (64 μ) mesh size during January 2020 to December 2020 of three different season. Algal samples were collected from subsurface area in the Dholawad Dam. Each sample was collected by filtering of water from different sites. Proper care was taken so that the water at the time of collection remains undisturbed. Sample was then preserved in Lugol's Iodine solution for further use. Water sample were collect to the surface of water and 50 liter of the sample passed through standard plankton net. The identification of phytoplankton was done with standard book and monographs (Fritsch, 1935).

Result and Discussion

Table 1: Seasonal variation in physico-chemical parameter of Dholawad Dam.

Parameters	Winter	Summer	Rainy
Water Temperature °C	16	30.4	24.7
TDS mg/lit.	245	227	274
Turbidity (NTU)	16.14	4.3	233.68
pH	7.8	8.5	7.4
Total Alkalinity	118	128	132
Total Hardness mg/lit.	128	143	137
Calcium mg/lit.	16	22	18
Chloride mg/lit.	18	22	25
DO mg/lit.	8.8	5.7	6.6

Water temperature minimum 16 °C recorded in winter season and maximum 30.4 °C was in summer season. Maximum TDS 274 mg/l was recorded during rainy season due to rain water collects from various region of catchment of Jamad river included dust particle and inorganic substance. Maximum turbidity 233.68 NTU was recorded during rainy season due to dust particle of catchment area which was added in the river water and affects the turbidity of water, minimum 4.3 NTU turbidity recorded during summer season. pH was goes to alkaline side it fluctuated between 7.4 to 8.5 high value of pH due to high rate of photosynthesis and sufficient quantity of carbonates in the dam water. Kumari *et al.* also reported same value in Punasa dam.

The total alkalinity showed the bicarbonates and carbonates of water which was maximum 132 mg/l recorded during rainy season and minimum 118 mg/l in winter season. Total hardness minimum 128 mg/l recorded during winter and

maximum 143 mg/l recorded during summer season attributed due to rising temperature. Zahoor *et al.*, (2012) [15] reported high value of total hardness. Calcium fluctuated between 14 mg/l to 22 mg/l maximum recorded during rainy and minimum in summer (Table 1).

Chloride 18 mg/l minimum reported during winter and maximum 25 mg/l recorded during rainy season same type observation was reported to Rawat and Trivedi (2018) [8] in same site. Kumari *et al.* reported high chloride in rainy season at Punasa dam Sewage discharged and anthropogenic activity is the reasons of chloride increase in the water.

Dissolve oxygen is very important parameter of water bodies. During the winter season DO was recorded in maximum value it was 8.8 mg/l. the peak value of DO might be due to high rate of photosynthesis by phytoplankton population that forms the major source of DO. It was inversely proportional to temperature, minimum value of DO 5.7 mg/l was recorded during summer season.

Table 2: Abundance of phytoplankton in three different season of Dholawad Dam

	Phytoplankton	Winter	Summer	Rainy
Cynophyceae				
1	Anabena sp.	C	AA	C
2	Anacytis sp.	C	C	Ab
3	Chroococcus sp.	C	AA	Ab
4	Oscillatoria sp.	C	C	Ab
5	Nostoc sp.	AA	AA	C
6	Spirulina sp.	AA	AA	C
7	Microcystis sp.	C	C	Ab
8	Phormidium sp.	R	C	R
9	Rivularia sp.	C	C	R
Chlorophyceae				
1	Chlamydomonas sp.	AA	AA	AA
2	Chlorella sp.	C	C	C
3	Cosmarium sp.	AA	AA	C
4	Closterium sp.	C	C	Ab
5	Eudorina sp.	AA	C	C
6	Hydrodictyon sp.	AA	AA	C
7	Pediastrum simplex	C	R	Ab
8	Pediastrum duplex	C	C	R
9	Scenedesmus sp.	C	R	Ab
10	Spirogyra sp.	AA	AA	C
11	Straurastrum sp.	C	C	R
12	Ulothrix sp.	AA	C	C
13	Volvox sp.	C	C	Ab
14	Zygenema sp.	C	C	R
Bacillariophyceae				
1	Amphora sp.	C	R	Ab
2	Cocconies sp.	C	C	R
3	Cymbella sp.	AA	C	C
4	Diatoma Species	C	R	R
5	Fragilaria Species	C	C	R
6	Gomphonema sp.	AA	C	C
7	Gyrosigma sp.	C	Ab	Ab
8	Melosira Species	C	R	Ab
9	Navicula sp.	AA	AA	C
10	Nitzschia sp.	AA	AA	C
11	Pinnularia sp.	C	R	R
12	Synendra sp.	C	C	R
13	Tabellaria sp.	C	R	Ab

AA- Abundance, C- Common, R- rare, Ab- Absent.

During the present work thirty six genera of phytoplankton were recorded which comprised, fourteen genera belonged to Chlorophyceae, thirteen genera belonged to Bacillariophyceae and nine genera from Cynophyceae. The

algal population showed the abundance in winter and summer (Table 2). Rainy season does not support it due to less light intensity and high turbidity.

Cynophyceae was reported in abundance during summer. Cyanophyceae. Similar groups of phytoplankton in river

Narmada also reported by Palharya and Malviya (1988) ^[7], Shrivastava (1999) ^[13], Verma (2006) ^[12] and Sharma *et al.* (2011) ^[11]. Winter and summer seasons were favourable for the algal growth, dust particle was settling down in the bottom of water body and water was goes to clear result turbidity decrease. Photosynthesis begins at depth due to light penetration the depths, and DO increases.

Conclusion

Dominance of phytoplankton in winter from November to February is associated with medium alkaline hard water, 16°C as the lowest temperature, higher DO and low turbidity. Water goes to eutrophic during rainy season. Dam water supply for drinking purpose to urban area continued monitoring necessary for it. Algae members *Anabena*, *Nostoc*, *Spirulina*, *Navicula*, *Nizschia*, *Hydrodictyon*, *Eudorina*, *Cosmarium*, *Chlamydomonas*, and *Chlorella Spirogyra* etc. were reported as common in rainy season they are pollution tolerate genera.

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