



A study of effect of Physico-chemical parameters on biodiversity of Diatoms special Reference to *Navicula* in river Narmada at Harda, M.P. India

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ABSTRACT

Present paper represents the seasonal variation of physico-chemical parameters and its correlation to species of diatom *Navicula*. *Navicula* is a dominant genus of diatom. Seasonal average value of physico-chemical parameters are displayed in the table. Fluctuation of Physico-chemical parameters can change the statics of diatoms. During the three year study period collecting the water sample of river Narmada on restrict site Handiya, and analyzed parameters in the laboratory. Diatom sample collecting with planktonic net of 0.06mm in the river and observe with the help of compound microscope. *Navicula lundii* and *N. venta* dominant species of diatom *N. capitatoradiata* are rarely seen in river water. Summer and winter seasons are favorable for diatom and rainy season does not support it.

Key word: Narmada, ecosystem, *Navicula*, physico-chemical, dominant,

INTRODUCTION

Water quality of fresh water is fully depends on physico-chemical parameters of river. Some parameters are minerals which are very important for aquatic life. Eurotropic River conducts various ecosystem of aquatic life. Physico-chemical parameters like light pH, temperature, turbidity etc. are balanced in water body. If any factor is being disturbed then the whole life will be affected of water body. Present paper represents the property of river water of Narmada and its correlation to diatom *Navicula*. The values of physico-chemical parameter are being fluctuated during the different season and it is change the statics of diatoms.

Abundance of diatoms is known to determine the water quality as indicators of nutrient rich environment. The knowledge about the seasonal variations and species occurrence with related climatic conditions are very useful for

the assessment of water quality and eutrophication in the related area (Gasiunaite *et al.*, 2005; Wang, 2006). The *Navicula* is a genus of diatoms which is belonging to family Naviculaceae, *Navicula* is boat shape and bilateral symmetrical golden brown algae which are include in Pinales order of the class Bacillariophyta. The *Navicula* genus of diatoms comprises over 1,200 species. It has narrowly lanceolate valves 26- 55 μm long, 4-5 μm wide and girdles 10-24 μm in depth. (Michael and James, 1988). It is dominant genera of fresh water diatoms. Its nineteen species reported during research work in different abundance. These diatoms are the main producer of the food chain (Taylor, 2005, Verlecar, 2006). River Narmada will provide information on seasonal change in abundance of diatom community under different climatic conditions and give an understanding about the survival of different livings.

MATERIAL AND METHODS

Narmada is a fifth largest river of India which is located in the north reason of the District Harda. Many sampling sites are available in the bank of river villages Chhipaner, Joga and Tehsile Handiya is located in the bank of river. These villages are sampling station for us. Diatom samples were collected with a plankton net

made of bolting silk cloth of 0.06 mm mesh size during July 2014 to December 2017 Diatom samples were collected from subsurface area, stones and the surface of livings (like plants) in the River Narmada. Each sample was collected by filtering of water from different places of the river. Proper care was taken so that the water at the time of collection remains undisturbed. Sample was then preserved in 4% formaldehyde for further use. Water sample were collect to the different depth and 50 liter of the sample passed through planktonic net of 0.06mm mesh size. The filtrate thus obtained was analyzed in Botany lab by method of fowling Taylor *et al.*, (2005) and identification of diatoms was done with standard book and monographs Fritsch, (1935).

The various physico-chemical and biological parameters were determined as per methods suggested by APHA (1987). Temperature, pH and Dissolved oxygen were recorded immediately after collection of sample at the sites, while other parameters were analyzed in the laboratory.

RESULTS AND DISCUSSION

The results of physico-chemical parameters of river water on the seasonal basis were tabulated in (Table 1).

Table 1: Showing the values of physico-chemical parameter in year 2014-15 to 2016-17.

S.No	Year→	2014-15			2015-16			2016-17		
	Parameters↓	Winter	Summer	Rainy	Winter	Summer	Rainy	Winter	Summer	Rainy
1	Conductivity μ mho	317	252	225	316	256	237	302	243	215
2	pH	8.3	8.4	8.1	8.4	8.3	8.0	8.4	8.2	8.1
3	TDS ppm	182	156	139	178	159	141	174	159	156
4	Temp °C	23.6	25.1	26.7	20.5	26.6	26.8	22.1	26.9	27.9
5	Turbidity (NTU)	18.6	2.6	300	19.8	2.6	348.5	14	1.2	335.8
6	Alkanity ppm.	180	142	129	174	141	135	160	144	109
7	Calcium ppm.	34	27	26	34	27	29	31	28	28
8	Chloride ppm.	9.1	8.7	6.4	9.2	9	7.3	8.8	8.2	6.7
9	Corbonate ppm.	5.4	7.9	2.1	3.6	8.2	4.5	5.7	5.9	5.0
10	Floride ppm.	0.17	0.14	0.31	0.18	0.16	0.33	0.33	0.18	0.57
11	Magnicium ppm.	16.7	14	12	17.7	13.8	11.4	18.3	56.7	13.5
12	Nitrate ppm.	1.61	0.33	1.21	1.4	0.63	1.4	1.41	0.88	3.49
13	Phosphate ppm.	0.066	0.158	0.225	0.142	0.196	0.28	0.171	0.144	0.215
14	Sulphate ppm.	9.8	2.7	11.5	11.9	3.7	11.1	9.7	3.9	11.6
15	BOD ppm.	1.6	6.2	6.5	1.4	6.1	5.7	1.1	1.5	6.5
16	COD ppm.	28	25	24.5	23.5	26.8	24.5	26	28	26
17	DO ppm.	7.5	6.4	6.2	7.2	6.7	6.8	7.2	7.1	5.7
18	Hardness ppm	154	113	106	160	113	113	151	118	114

Table 2: Showing *Navicula* species seen in different season of year 2014 to 2017.

	Year →	2014-15			2015-16			2016-17		
		Taxon↓	Winter	Summer	Rainy	Winter	Summer	Rainy	Winter	summer
1	<i>Navicula antonii</i>	+	+++	-	+	+++	-	+	+++	+
2	<i>N. capitatoradiata</i>	+	+	-	-	+	-	-	+	-
3	<i>N. cataracta-rheni</i>	+	++	-	+	+	-	-	+	-
4	<i>N. caterva</i>	++	+++	+	++	+++	+	+	+++	-
5	<i>N. cincta</i>	+	+++	+	+	+++	+	+	+++	+
6	<i>N. cryptocephala</i>	+	++	-	+	+	-	++	++	-
7	<i>N. cryptotenella</i>	++	+++	+	++	++	-	+	+++	+
8	<i>N. erifuga</i>	++	++	+	-	++	+	+	++	+
9	<i>N. exilis</i>	+	+	-	-	+	-	+	++	-
10	<i>N. lundii</i>	++	+++	++	++	+++	+	++	++	++
11	<i>N. linearis</i>	++	+++	+	+	++	+	++	+++	
12	<i>N. microdigitoradiata</i>	++	++	-	+	++	-	+	++	+
13	<i>N. minuta</i>	+	++	-	++	++	-	+	++	-
14	<i>N. notha</i>	++	++	+	+	++	+	++	++	+
15	<i>N. pupla</i>	++	-	-	++	++	+	++	++	+
16	<i>N. rhynecephala</i>	+	+	-	+	++	-	+	++	-
17	<i>N. rostellata</i>	+	+	-	-	+	-	-	+	-
18	<i>N. rostrata</i>	+	+	-	+	++	+	++	++	-
19	<i>N. upsaliensis</i>	-	+	-	+	+	-	-	+	-
20	<i>N. veneta</i>	++	+++	++	++	+++	+	+++	+++	+
21	<i>N. viridula</i>	++	+++	-	++	++	+	++	+++	+

Rare = +, Common = ++, Abundance = +++, Absent = -.

Conductivity is an important parameter of aquatic environment. On an average seasonal basis, the maximum conductivity 317 μ mho observe in winter 2014-15 and minimum conductivity observe 215 μ mho in rainy season 2016-17. pH can decide the concentration of hydrogen ions it was increase during the rainy season because carbonates, sulfates contain dissolve in water body and pH value going to decrease, maximum average pH value 8.4 recorded during summer season 2014-15 and minimum value 8.0 recorded in rainy season in the year 2015-16. Summer season is the favorable for diatoms because evaporated river water increases the minerals and nutrients concentration in water body.

TDS value will be affected in winter and summer season maximum average value 182 ppm. and minimum average value 139 ppm. recorded in rainy season 2014-15. Temperature is one of important factor of water body minimum average temperature 20.5 °C recorded during winter season 2015-16 and maximum average temperature 27.9 °C recorded in rainy season 2016-17.

This temperature is a variable influencing photosynthetic rate of diatoms. Turbidity of water can determine the light penetration in the water body, as turbidity progress light penetration decreases and photosynthesis rate also decrease. In the rainy season turbidity increase up and settle down after it. Maximum average turbidity value 348.5 NTU seen in 2015-16 in rainy season, and minimum value 1.2 NTU seen in 2016-17 during summer. Alkanity of water are dependent on the strength of carbonate ion, it is responsible for the growth of increasing pH above 7.0 the pH value correlated to alkanity. Chloride and Fluoride values are indicate the domestic use of river water because bathing and the use of detergent give affect it. Phosphate sulfate and other anions important part of nutrients which are affect the growth of diatom. Biological oxygen demand is determinate contamination of water. When light penetrate the water body and capturing by the aquatic producer. Producer starts the photosynthesis in the presence of light and increase the amount of dissolve oxygen in river water. BOD exposes deficiency of oxygen which is utilized by bacterial respiration and DO

releasing oxygen maximum value of BOD 6.5 ppm. was in rainy season 2014-15 and 2016-17 year. And minimum 1.1 ppm was recorded in winter season 2016-17. DO 7.5 ppm maximum in winter and minimum 5.7 seen in rainy season 2016-17.

Navicula is dominant genera in river water which is seen in complete year in fresh water some species of these genera like *Navicula lundii*, *N. notha*, *N. cryptotenelloids* and *N. cinacta*, are found in complete year in large abundance and *N. crptocephala*, *N. cataracta-rheni*, *N. microdigitoratdiata*, *N. symmetrica* are common genera which are seen in winter and summer season of river these are disappear in rainy season. Some case of *Navicula* diatom is summer diatom which is seen only in summer season in river. Result of research displayed the seasonal effect on diatoms growth because rainy season does not support the growth of diatom. Rainy season river water turbidity is going to increase and light cannot penetrate the water body and aquatic photosynthesis does not appear. Value of Biological oxygen demand will increase in rainy season. Dust and soil particle slowly settle down after rain and water transparency is going to increase and light generate the aquatic life under the water in winter season. In summer season temperature will be increase and water are doing evaporate these factor responsible for increasing so result is diatoms growth are fast then other season.

CONCLUSION

Narmada River harbors 21 species of diatom *Navicula* which belong to family Naviculaceae of class *bacillariophyceae*. *Nacicula caterva*, *N. cincta*, *N lundii*, and *N. veneta* seen in complete year in river water and *N. capitatoradiata*, *N. irmengardis* are rare and *N. rostellata* is very rare which is seen only in summer season. Summer season are favorable for diatoms because light penetrate in the water depth and build the photosynthesis due to settled downed of soil particle and water evaporation increase the nutrients concentration of river water.

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