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ALGAL BIODIVERSITY IN FRESH WATER RESERVOIR OF DURG

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ABSTRACT

The present study was undertaken to study the Physico-chemical properties of water and seasonal algal diversity of Shivnath river at a stop dam constructed near Durg city of Chhattisgarh state..The study revealed the presence of 25 different species of algae. During the study period members of Chlorophyceae dominated the algal community, followed by members of Cyanophyceae and Euglenophyceae. .Zygnematales and chlorococales shows maximum species diversity in comparision to Rivulariales,volvocales and Euglenales. Thallus diversity from prokaryotes to eukaryote at cellular level and motile Euglena to non motile all other member and morphologically unicellular *Chlamydomonas* to well organised thallus or *Chara* and *Nitella* shows tendency towards tree habit through coenobial *Volvox* and colonial *Nostoc* filamentous *Spirogyra, Mougeotia ,Zygnema, Oedogonium, Ulothrix* etc.

Key words: Shivnath river, Physico-chemical properties, seasonal algal diversity, Chlorophyceae, Cyanophyceae and Euglenophyceae.

Water plays a pivotal role for the survival of mankind. Of the 71% of water covering the Earth's surface, only 3% is fresh water, 97% constitute marine water. Phytoplankton are vital for almost all the fresh water ecosystems as they play an important role through primary productions in the food chain, they are also a useful tool for the assessment of water quality.

Assessment of physico-chemical and biological parameters serves a good index in providing particular status to a water body. Algae are ecologically important as well as they are known to produce more oxygen than all plants in the world put together. Though the knowledge of algal forms in rivers in India is limited but recently phytoplankton of fresh water rivers have been studied in detail (Mishra *et al.,* 2002, Jafri and Gunale 2006, Shashi Shekhar *et. al.,* 2008, Annalakshmi and Amsath 2012). The assessment of water quality using phytoplankton diversity and their association as biological indicators has been carried out by several workers (Chaturvedi *et al.,* 1999). Seasonal variation of algal forms in lakes and rivers is presented by many researchers (Kaur *et al.,* 2001, Jarousha 2002, Tiwari and Chauhan 2006). Algal biodiversity of water bodies have been studied by several workers in India.(Anuja and Chandra 2012; Das and Adhikary 2012; Jadhavar and Papdiwal 2012).Algal members are rich in different phycochemicals (Bharadwaj *et. al.* 2014). Distribution of algae and their variation at different zones of a water body is influenced by physico-chemical parameters of water. The algal growth in a habitat influences the ecosystem and responds rapidly to changes in the aquatic environment particularly in relation to nutrients. As per Goswami (2012) the first step towards the conservation of an aquatic system should be on the identification and assessment of biodiversity composition of a lake.

Chhattisgarh state is situated in central India and is endowed with rich natural resources. The city of Durg is an important city of Chhattisgarh lying between 20°23' and 22°02' N Latitude & Between & 80°46' and 81°58 E Longitude. The mean height above sea level is 317.00 m.

The present investigation was carried out as an attempt to assess the diversity status of phytoplankton along with the physico-chemical parameters of river Shivnath at the Kotni stop-dam near Durg city in Chhattisgarh state.

MATERIALS AND METHOD

Water and Algal samples from three different sites in the Shivnath river were collected during the period April 2012 to March 2013. Samples were analysed for physico-chemical parameters like water temperature which was tested using Celsius thermometer at the sampling sites at the surface and bottom of the water. pH was

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measured using pH meter in the field itself, while samples for dissolved oxygen were fixed on the spot by Winkler's reagent and further estimated in the laboratory. Biological oxygen demand was also calculated by incubating the water samples in BOD incubator for three days and determining DO again the difference between the two values gave the Biological oxygen demand of the samples. The samples were carefully collected, cleaned in clean water to remove all the extraneous matter and were observed fresh by preparing wet mounts within 48 hrs. Then the samples were further preserved in Lugol's solution and 4% formaldehyde solution separately for detailed study

Chlorophycean algae were stained with iodine and mounted in glycerine. The collected algal forms were observed under microscope, and identified them by referring to the standard literature on algae (Desikacharya, 1959; Fritch 1935, Prescott, 1951; Randhawa, 1959; Sarode and Kamat, 1984; Smith, 1920).

RESULT AND DISCUSSION

Table-1 represents data on physico-chemical from the selected study area. In the present study the physico-chemical analysis has been done by taking an average of the data collected during months of a season at regular intervals of 7 days. Highest temperature was reported during summer months which can be due to the influence of atmospheric temperature (Jayaraman *et al.* 2003). *p*H is one of the most important factors that serves as an index of the pollution. Water showed slight to highly alkaline pH, which showed increased photosynthetic activity. pH was reported slightly higher during summer months, which may be attributed to the increased photosynthetic activity in the aquatic body which demand more CO_2 than furnished by respiration and decomposition. The amount of oxygen in an aquatic ecosystem is dependent on temperature, photosynthetic activity, respiration and organic loading. The higher values in winter months may be due to higher solubility of oxygen at relatively lower temperature and relatively high DO in monsoon may be attributed to circulation and mixing of water due to surface runoff. The lower values of dissolved oxygen

During summer months can be probably due to the rise in temperature which leads to the warming of water and ultimately helps in an increase of mineralization of nonliving matter which demands oxygen (Kumar *et al.,* 2005).

Table-1 Seasonal variation of Physico-chemical properties of water at sampling sites

Parameter	Winter	Summer	Monsoon
Temperature (^oC)	26.5^oC	34.5 ^oC	28.5 ^oC
pH	6.7	8.7	7.4
Dissolved Oxygen (ppm)	7.6	5.7	6.9
Biological Oxygen Demand	2.1	6.5	4.2

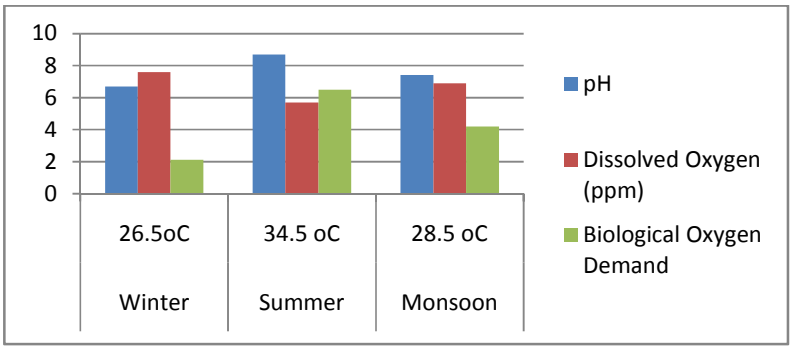


Table-2 shows the seasonal diversity of algal flora in the study area. A total of 25 fresh water algal genera belonging to Class Cyanophyceae, Chlorophyceae, Charophycecae and Euglenophyceae have been reported from the study area. Members of Chlorophyceae were found to be dominating represented by 15 genera and 16 species constituting 61.53% of the total algal community. *Meuogotia, Spirogyra, Hydrodictyon* and *Ulohrix* were reported throughout the year at all sampling sites. The highest

diversity of Chlorophyceae indicated relatively good health of the river Shivnath as suggested by Descy (1987). Cyanophyceae was represented by 6 genera representing 23.07% of the algal community. Four species of Euglena were reported representing 15.38% of the total algal community. The identified genera showed wide range of thallus organization from unicellular (motile and non motile), colonial to filamentous (branched and unbranched) thallus. Diversity was found be maximum during monsoon as the environmental conditions are favourable for the algae. Summers although showed decrease in the habitat but algal diversity was seen to be high in the limited amount of water that was available. Winter temperature was probably not suitable for most of the algal flora and therefore the number decreased during the winter months.

The observations reveal certain interesting facts about the obtained algal species from the selected sites. Table 3 shows the number of species occurring in various thallus organizations. Studying the systematics of the algal species it was found that the 25 species observed belonged to 14 families included under 10 orders.The first 3 orders belong to Cyanophta, next 5 orders to Chlorophyta, 1 each to Charophyta and Euglenophyta.

Table-2 Seasonal variation of algal diversity in Shivnath river

S.No.	Name of the algae	Winter	Summer	Monsoon
1.	*Characium angustum*	+	+	+
2.	*Chlamydomonas globosa*	+	+	+
3.	*Chlorella vulgaris]*	-	+	+
4.	*Closterium parvulum*	-	+	+
5.	*Scenedesmus abundance*	-	+	+
6.	*Pediastrum boryanum*	-	-	+
7.	*Pediastrum simplex*	-	+	+
8.	*Hydrodictyon reticulatum*	+	+	+
9.	*Mougeotia recurva*	+	+	+
10.	*Oedogonium sp.*	+	+	+
11.	*Spirogyra hyalina*	+	+	+
12.	*Zygnema pectinatum*	+	+	+
13.	*Ulothrix zonata*	+	+	+
14.	*Chara zeylanica*	+	+	-
15.	*Nitella flexilis*	+	+	-
16.	*Anabaena verrucosa*	+	+	+
17.	*Nostoc commune*	-	-	+
18.	*Oscillatoria princeps*	+	+	+
19.	*Rivularia sp.*	-	-	+
20.	*Phormidium sp.*	-	-	+
21.	*Lyngbya sp*	-	-	+
22.	*Euglena sanguinea*	+	+	+
23.	*Euglena viridis*	+	+	+
24.	*Euglena polymorpha*	+	+	+
25.	*Euglena gracilis*	+	+	+

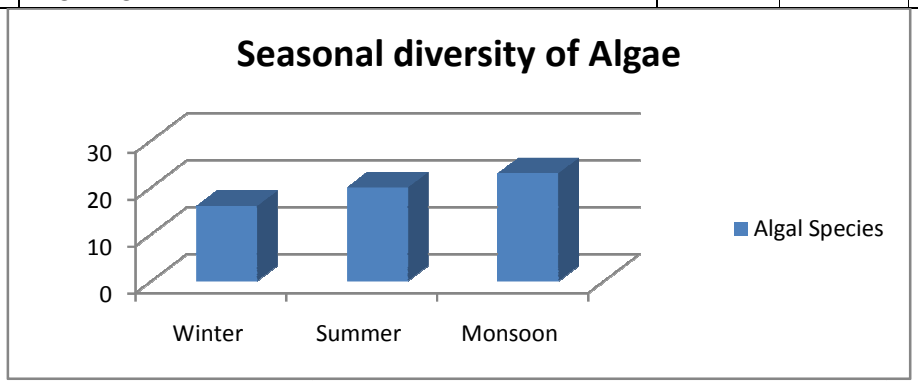


Table-3 Thallus organisation of observed algal species

S.No.	Thallus organizations	Number of species
1.	Unicellular (Motile)	5
2.	Unicellular (Non-Motile)	3
3.	Coenobium	4
4	Colonial	3
5	Unbranched Trichomes	3
4.	Unbranched filamentous	5
5.	Branched filamentous	2

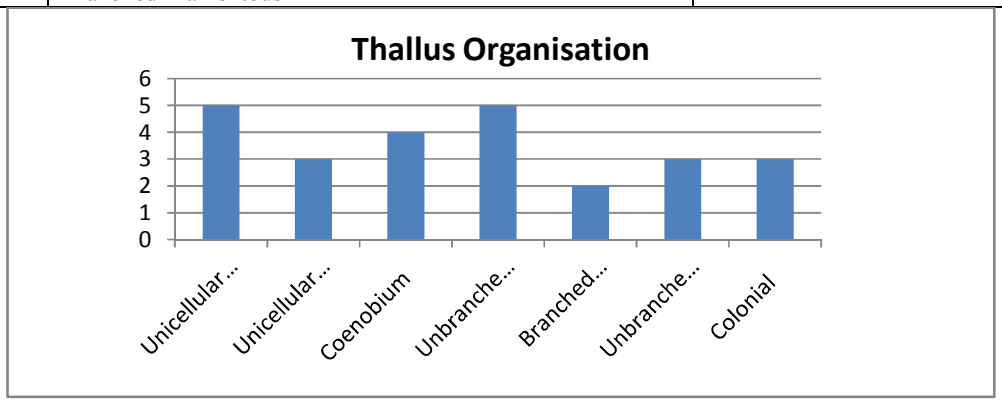
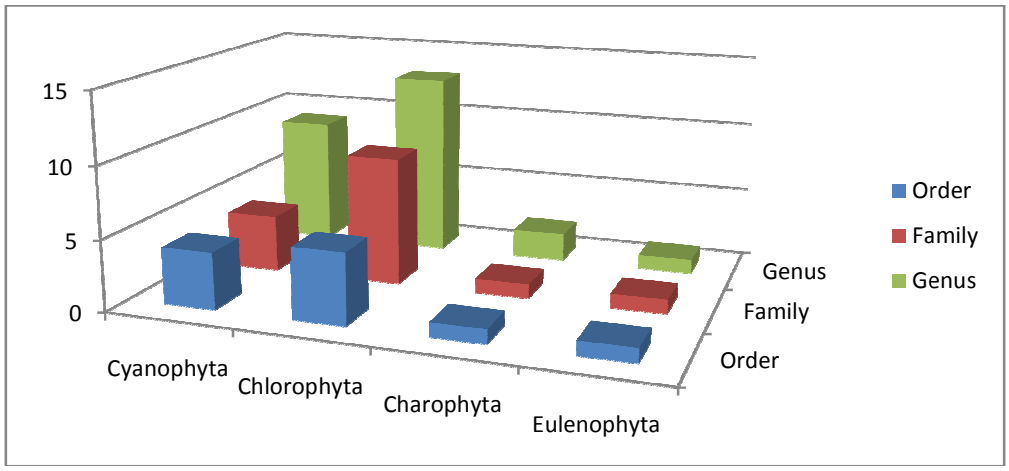


Table-3 Systematics of algae

Class	Order	Family	Genus
Cyanophyta	Oscillatoriales	Oscillator	*Oscillatoria*
			Lyngbya
			Phormidium
	Nostocales	Nostocaceae	*Anabaena*
			Nostoc
	Rivulariales	Rivulariaceae	*Rivularia*
Chlorophyta	Volvocales	Chlamydomonadaceae	*Chlamydomonas*
	Clorococcales	Characiaceae	*Characium*
		Hydrodictyaceae	*Hydrodictyon*
			Pediastrum
		Chlorellaceae	*Chlorella*
		Coelestraceae	*Scenedesmus*
	Ulotrichales	Ulotrichaceae	*Ulothrix*
	Oedogoniales	Oedogoniaceae	*Oedogonium*
	Zygnemales	Zygnemaceae	*Mougeotia*
			Spirogyra
			Zygnema
		Desmidiaceae	*Closterium*
Charophyta	Charales	Characeae	*Chara*
			Nitella
Eulenophyta	Euglenales	Euglenaceae	*Euglena*



CONCLUSION

Present study shows seasonal diversity richness in monsoon followed by summer and winter due to variation in temperature and light intensity. Variation of cellular organisation from prokaryotes to eukaryotes at cellular level in Cyanophyta and others classes was noticed. On the basis of motility it shows a clear character of motility to non motility. In morphology there is great organisation diversity from unicellular, colonial to coenobial form unbranched to branched thallus. Thus in in a water body how this mechanic diversity occur is a matter of further study.

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