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A STUDY ON THE DISTRIBUTION OF PHYTOPLANKTON IN THE RIVER SENGAR, IN DISTRICT ETAWAH (U.P.)

Roop Kishore*, Kaushal Kishor** and K.K. Saxena***

Key words : Distribution, Phytoplankton, River Sengar.

Limnological distribution of phytoplankton was carried out in the river Senger at district Etawah (U.P.) from January, 2010 to December, 2012. The quantitative analysis revealed that the highest population of phytoplankton was noted at station 'C' as 818.5 individuals per litre during summer season in the month of June, 2012 whereas the minimum number of the phytoplankton was observed at the station 'D' being 17.2 individuals per litre in the month of December, 2012. The dominant forms among Chlorophyceae were *Volvox, Spirogyra, Chlorella, Oedogonium, Consmarium* and the Bacillariophyceae were *diatoma, Cymbella, Rhyzosoloenia, Tabelaria* and *Milosira* whereas the Myxophyceae were *Nostoc, Spirulina, Oscillatoria* and *Nicrocystis*.

INTRODUCTION

Conservation of natural resources is very important security for sustainable development. Therefore, adequate arrangements are necessary to be made in order to save the fresh water and its inhabitants. A comprehensive knowledge of the fauna and their distribution is a prerequisite for the management and conservation of any ecosystem. Phytoplanktons are the main primary producers in the aquatic ecosystems. Primary production is an important biological phenomenon in the aquatic environment, on which the entire heterotrophic community depends directly or indirectly. Primary production by phytoplankton is greatly affected by pollution in the river (Mishra, 1990; Sahu, 1991 , Srivastava, 1993).

The river Sengar originates from and flows through agricultural lands known as Gangetic plains and confluences with the river Yamuna. The river has its stretch of about 300 Km. The present study was conducted on the distribution of phytoplankton in the river Sengar, at District Etawah (U.P.) which has been polluted because, as per geographical preview, Shikohabad and several villages discharge their domestic and industrial wastes into this river. The river is reduced to a slow spill channel during summer. Moreover, pollution load is increasing at a fast rate due to rapid industrialization and urbanisation.

THE RESEARCH SITES

The river receives water from a few tributaries from the point of its origin to the point of confluence. The bed becomes clayed and traverses through alluvial soil. Limnological investigations were carried out in the river Sengar in District Etawah (U.P.) in the stretch of about 80 Km from Dhauna to Dibiapur. In all, five sampling stations were set up in varied ecological conditions of both the banks of the river.

The first sampling station 'A' was set up near the entry point in district Etawah at Dhanua village. Costal vegetation is full of wild weeds and the soil is saline. Surrounding area is a plain cropland with alluvial clay. The station 'B' was set up near the confluence of its tributary 'Sirsa' river at Chakwa which is about 30 km away from the 1st sampling station. The soil is saline and coastal vegetation has wild weeds. The sampling site 'C' was set up near the village Morhi which is about 20 Km ahead from sampling station 'B'. The river path is very broad and deep with a sandy soil. Coastal vegetation is full of wild weeds and shrubs. The station 'D' is located near village Jua. The distance covered up to this station is about 15 Km from station 'C'. The river here is very wide deep with sandy substratum. The fifth and last sampling station 'E' was set up near Dibiyapur. It is about 15 Km away from the station 'D'. The river bed is sandy and costal vegetation is full of wild shrubs.

MATERIALS AND METHODS

For qualitative analysis of phytoplankton population the standard plankton net was hauled through vertical and horizontal plane of the river. In the laboratory, the phytoplanktons were mounted on glass microslides cleaned with sulphuric acid and potassium dichromate. Identification was done at 1000 x and phytoplanktons were identified at different sampling stations.

The collected samples were then transferred into small plastic bottles. After sedimentation of the phytoplankton, the supernatant liquid was siphoned and the sediment portion was preserved in 4% formaldehyde. The quantification of phytoplankton was made using "Haemocytometer method" described by Trivedy and Goel (1986) and expressed in number per litre.

RESULTS AND DISCUSSION

The river Sengar passes through varied topographical and meteorological conditions, hence it provides heterogeneous ecosystem. There are definite interrelationships between plankton and physico-chemical factors of the river Sengar and an analysis of data reveals the fluctuations and their bearing on the plankton population.

The investigations on the river Sengar were conducted fortnightly at five sampling stations (A to E) within a stretch of nearly 80 Km (Figure-1). All stations were sampled from January 2010 to December 2012. The phytoplanktons are

*P.G. Deptt. of Zoology, Bareilly College, Bareilly
**P.G. Deptt. of Zoology, Janta College, Bakewar, Etawah
***P.G. Deptt. of Zoology, Janta Mahavidyalay, Ajitmal, Auraiya.

the producers in the aquatic food chain, which are consumed by zooplanktons. Three families of the phytoplankton, viz. Chlorophyceae, Bacillariophyceae and Myxophyceae were recorded. Steeman (1937) correlated the population of the phytoplankton and Zooplankton in the sea.

Normally the highest and lowest number of phytoplanktons were observed during the monsoon season in July 2012 (654.1/litre) and winter season in December 2010 (31.7/litre) respectively at the first sampling station 'A' .

At station 'B' the minimum number of phytoplankton was 41.0/litre in December 2012 and maximum 818.3/litre in June 2010 whereas at station 'C' minimum number of 22.3/litre in December 2012 and maximum of 818.5/litre were recorded in June 2012. Station 'D' has the minimum number of phytoplankton as 17.2/litre in December 2012 and maximum 250.1/litre in the month of May 2010. At station 'E' the minimum number of phytoplankton was 33.6/litre in December 2010 and maximum as 644.7/litre in July 2011.

Wojciechowask (1990) has given the correlations of biomass, chlorophyll 'a', photosynthesis and phytoplankton structure in a lake.

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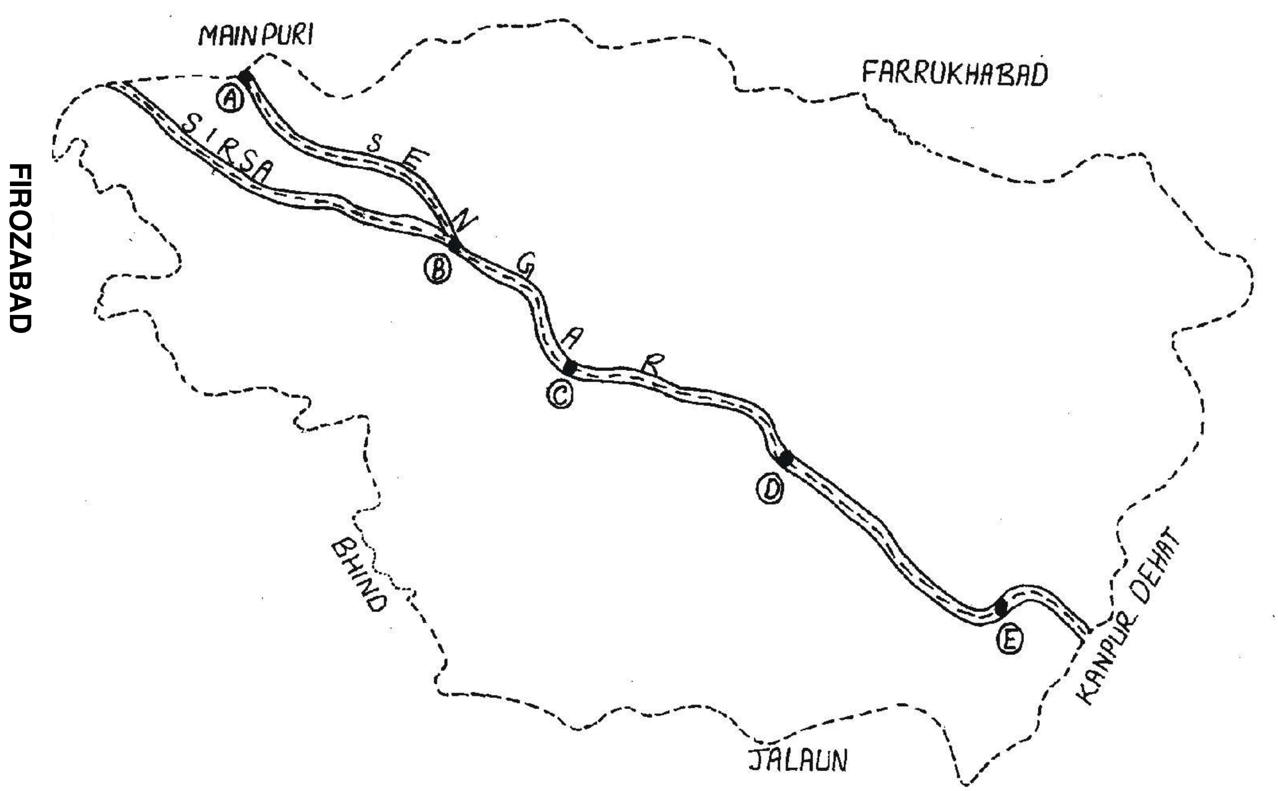

Fig. 1. : Showing Sampling Stations From A to E.

TABLE-1 : Phytoplankton count of the river Sengar at Station 'A' in different years & different seasons.

Phytoplankton	Winter			Summer			Monsoon			Autumn		
2010	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sep**	**Oct**	**Nov**
Chlorophyceae	9.2	14.3	17.2	20.6	32.8	83.2	86.3	90.5	65.3	42.5	26.5	12.3
Bacillariophyceae	8.4	9.3	11.5	17.5	64.4	72.3	62.4	60.7	52.4	27.6	16.2	13.6
Myxophyceae	14.1	18.7	20:6	32.3	75.2	96.3	82.4	77.5	60.6	31.5	21.2	15.8
Total	31.7	42.3	49.3	70.4	172.4	251.8	231.1	228.7	178.3	101.6	63.9	41.7
2011												
Chlorophyceae	14.5	20.4	18.5	34.6	43.5	205.7	215.3	249.6	127.5	66.5	33.8	20.8
Bacillariophyceae	13.8	13.5	12.5	27.5	104.5	166.5	207.5	132.8	115.8	46.6	18.9	16.7
Myxophyceae	22.9	20.6	25.6	48.5	155.2	212.8	204.5	222.9	118.9	54.8	25.6	18.9
Total	51.2	54.5	56.6	110.6	303.2	585.0	627.3	605.3	362.2	167.9	78.3	56.4
2012												
Chlorophyceae	13.5	15.5	21.5	36.5	37.8	198.8	213.8	243.8	122.8	58.6	36.5	15.8
Bacillariophyceae	12.3	10.5	14.8	25.8	97.8	162.5	202.8	191.8	117.5	47.5	21.8	11.8
Myxophyceae	20.5	23.8	25.8	48.5	145.5	223.5	200.9	218.5	110.8	50.8	26.2	17.5
Total	46.3	49.8	62.1	110.8	281.1	584.8	617.5	654.1	350.8	156.9	84.5	45.1

Organisms/litre

TABLE-2 : Phytoplankton count of the river Sengar at Station 'B' in different years & different seasons.

Phytoplankton	Winter			Summer			Monsoon			Autumn		
2010	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sep**	**Oct**	**Nov**
Chlorophyceae	16.3	20.4	20.7	46.3	210.5	240.4	280.5	190.3	80.3	56.2	36.2	18.3
Bacillariophyceae	10.2	14.3	16.8	28.2	105.3	186.3	227.3	105.7	55.4	36.2	23.7	15.7
Myxophyceae	24.3	23.5	32.4	57.3	215.5	265.6	310.5	165.2	74.3	40.3	30.2	16.3
Total	50.8	58.2	69.9	131.8	531.3	692.3	818.3	461.2	210.0	132.7	90.1	50.3
2011												
Chlorophyceae	12.3	15.1	20.0	31.6	42.5	190.3	201.1	245.0	125.5	63.3	31.4	18.3
Bacillariophyceae	10.5	12.3	12.8	25.3	101.3	170.3	201.3	187.0	112.8	51.3	20.4	11.3
Myxophyceae	19.5	22.1	28.1	. 40.1	150.3	221.0	139.7	214.'0	110.3	51.3	23.4	14.3
Total	42.3	49.5	60.9	97.0	294.1	581.6	542.1	646.0	348.6	165.9	75.2	43.9
2012												
Chlorophyceae	10.3	17.2	20.1	36.5	40.7	202.8	215.2	246.2.	124.2	63.3	34.8	16.8
Myxophyceae	19.8	21.8	25.3	45.1	152.1	214.4	204.5	218.3	115.4	50.7	22.5	15.2
Total	41.0	51.1	58.1	105.7	294.0	580.4	623.8	598.0	352.2	156.9	73.5	44.9

Organisms/litre

TABLE-3: Phytoplankton count of the river Sengar at Station 'C' in different years & different seasons.

Phytoplankton	Winter			Summer			Monsoon			Autumn		
2010	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sep**	**Oct**	**Nov**
Chlorophyceae	4.3	10.2	11.4	15.0	25.2	55.3	57.1	62.8	35.3	21.1	20.2	6.8
Bacillariophyceae	6.9	6.6	8.2	11.5	40.5	61.3	52.6	50'.7	30'.2	18.0	11.2	8.5
Myxophyceae	11.1	10.5	16:0	25.1	42.5	64.2	61.0	64.0'	41.0	22.1	14.5	11.0
Total	22.3	27.3	35.6	51.6	108.8	180.8	170.7	177.5	106.5	61.2	46.0	26.3
2011												
Chlorophyceae	13.8	17.5	20.5	45.2	210.5	240.3	280.5	190.7	85.3	53.2	36.3	18.2
Bacillariophyceae	9.4	11.2	12.7	26.3	103.2	183.2	228.2	100.5	60.3	36.3	24.2	13.3
Myxophyceae	19.3	23.3	27.3	56.8	205.7	270.5	301.2	160.7	74.3	40.7	20.5	14.5
Total	42.5	52.0	60'.5	128.3	519.4	694.0	809.9	451.9	219.9	130.2	81.0	46.0
2012												
Chlorophyceae	17.9	20.4	23.2	47.5	213.3	246.5	283.4	195.2	84.5	57.3	37.5	20.0
Bacillariophyceae	11.5	13.6	15.3	27.6	105.5	185.5	227.3	103.5	62.2	38.4	25.0.	15.2
Myxophyceae	23.2	24.8	30.8	56.6	210.3	267.2	307.8	167.8	75.5	42.0	21.8	17.5
Total	52.6	58.8	69.3	131.7	529.1	699.2	818.5	466.5	222.2	137.7	84.3	52.7

Organisms/litre

TABLE-4: Phytoplankton count of the river Sengar at Station 'D' in different years & different seasons.

Phytoplankton	Winter			Summer			Monsoon			Autumn		
2010	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sep**	**Oct**	**Nov**
Chlorophyceae	9.4	12.5	16.2	18.2	28.2	82.4	85.2	88.7	63.2	40.3	24.3	13.7
Bacillariophyceae	7.9	10.4	10.5	18.6	57.6	70.3	60.5	61.2	50.3	28.7	18.2	14.2
Myxophyceae	12.2	20.3	21:3	30.2	74.5	97.4	78.3	74.7	58.3	32.6	23.4	16.1
Total	29.5	43.2	48.0	67.0	160.3	250.1	224.0	224.6	171.8	101.6	65.9	44.0
2011												
Chlorophyceae	6.2	11.3	12.5	15.1	16.5	24.5	52.3	59.3	35.1	22.0	18.1	6.5
Bacillariophyceae	7.1	6.5	6.3	11.5	41.3	55.3	55.1	52.4	31.1	18.2	11.1	7.2
Myxophyceae	11.1	12.5	13.3 .	20.1	42.4	60.3	61.4	62.8	41.0	22.1	16.0	11.2
Total	24.4	30.3	32.1	46.7	100.2	140.1	168.8	174.5	107.2	62.3	45.2	24.9
2012												
Chlorophyceae	4.8	12.3	12.5	16.1	25.3	51.3	60.1	61.3	44.1	22.3	20.1	5.3
Bacillariophyceae	3.1	7.5	6.9	13.1	43.1	61.3	53.3	57.1	32.1	17.1	13.1	9.3
Myxophyceae	9.3	11.4	16.3	23.5	41.3	63.4	63.3	71.3	41.3	22.1	19.3	11.3
Total	17.2	31.2	35.7	52.7	109.7	176.0	180.7	189.7	117.5	61.5	52.5	25.9

Organisms/litre

TABLE-5: Phytoplankton count of the river Sengar at Station 'E' in different years & different seasons.

Phytoplankton	Winter			Summer			Monsoon			Autumn		
2010	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sep**	**Oct**	**Nov**
Chlorophyceae	10.5	14.5	12.5	20.5	28.0	85.0	82.5	87.5	66.0	42.1	25.1	16.9
Bacillariophyceae	10.8	11.6	9.5	21.5	52.5	71.2	56.5	60.8	54.2	25.5	20.5	15.5
Myxophyceae	12.3	22.3	21:0	27.6	70.5	99.5	78.6	74.6	61.5	28.8	25.8	18.5
Total	33.6	48.4	43.0	69.6	151.0	255.7	217.6	222.9	181.7	96.4	71.4	50.9
2011												
Chlorophyceae	11.4	17.3	19.7	34.7	40.3	195.8	210.5	240.5	120.5	60.5	34.3	17.3
Bacillariophyceae	10.3	11.4	12.6	26.4	100.5	160.7	200.8	188.6	115.7	45.3	18.7	12.4
Myxophyceae	18.2	21.5	28.3	45.2	148.8	220.3	197.6	215.6	108.3	52.7	24.2	15.7
Total	39.9	50.2	60.6	106.3	289.6	576.8	608.9	644.7	344.5	158.5	77.2	45.4
2012												
Chlorophyceae	12.3	18.2	20.7	36.8	41.7	203.2	217.3	247.5	125.3	64.3	35.6	17.7
Bacillariophyceae	11.5	12.3	13.8	25.2	102.4	164.3	205.2	134.2	113.7	44.3	17.8	14.6
Myxophyceae	20.8	22.5	27.3	46.2	153.2	215.6	205.4	219.7	116.6	51.4	23.2	16.8
Total	44.6	53.0	61.8	108.2	297.3	583.1	627.9	601.4	355.6	160.0	76.6	49.1

Organisms/litre