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Impact of sewage effluents on wetland flora of Azamgarh District

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ABSTRACT

Sewage effluents were studied in polluted water including toxic damages on the flora of the area of Azamgarh district of Uttar Pradesh, India.

Figure : 00 References : 05 Tables : 02

KEY WORDS : Effluent, Flora, Phytoplankton, Sewage, Wetland.

Introduction

Increasing in population and industrialization have seriously destroyed the soil and water bodies. Many of them are unfit for use and are getting extinct by silting, dumping of solid wastes and eutrophication. Water bodies situated in populated urban environs receive contaminated water from surface drainage. Eutrophication of water bodies is also intensified due to washing of clothes, use of soaps in bathing and excessive input of organic wastes.

The quality of water after use gets degraded in most cases and is let out as effluents. This has resulted into scarcity of unpolluted water. Wastes disposal in water bodies cause undesirable effect on the wetland soil ecosystem and hydrological cycle. Due to exploitation, water is becoming scarce day by day[5]. The physicochemical properties of effluents from industries and sewage have been studied[3].

Wetlands soil in Azamgarh district experience periodical submergence and exposure, erosion, siltation grazing, sera ping, discharge of domestic wastes and effluents, washing and distribution of natural herbaceous vegetation. Normally there a good vegetation cover is ideal to check soil and nutrient erosion. However all around the wetland soil, there are a dense human and cattle population and therefore the level of biotic disturbances is also high.

The import of domestic wastes, soil and water, run off from surrounding uplands and excreta of grazing animals add to the eutrophication process. Herbaceous species on these sloping landscapes effectively reduce nutrient loss[1].

Materials and Methods

Study site

Three sites were selected for studies. Site-A is a part of Azamgarh specially Phoolpur (Durvasha Dham) and Rajghat which receives heavy discharge of different sewage effluent. It is heavily polluted and the wetland is luxuriant growth of *Typha* and *Echhornia*. Site-B is moderately polluted and is located in southern bank of Tamsa while Site-C is on the other side on north bank of Tamsa and is relatively less polluted.

The wetland soil is being polluted by discharge of untreated industrial effluents. Sewage and municipal wastes, kitchen and other house hold wastes carried by drains, surface run off oil, metal scrapes, semi burn coal and ash.

Climate

The climate of the study area is typical mansoonic, characterized by long days of hot and dry summer, warm and moist rainy and short day of cold and dry winter season. Relative humidity is high in the rainy and low in the summer and winter season. The average mean maximum relative humidity during the study period was

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TABLE-1 : Seasonal Fluctuation in Phytoplankton Distribution at Different Sampling Sites of Azamgarh Wetland

Name of Genera	Site-A			Site-B			Site-C		
	W	S	R	W	S	R	W	S	R
1. Bacillariphyceae									
Gomphonema	-	-	-	+	+	-	+	+	-
Diatoma	-	-	-	-	-	-	+	+	-
Fragilaria	-	-	+	-	+	+	+	+	+
Navicula	-	-	-	-	+	-	-	+	+
Nitzchia	-	-	-	-	-	-	+	+	-
Pinularia	-	+	-	+	+	-	-	-	-
Total No. of Genera	0	1	1	2	4	1	4	5	2
2. Chlorophyceae									
Bulbocheate	-	-	-	-	+	-	-	-	-
Chara	+	+	+	+	+	+	-	-	-
Chlorella	+	+	+	-	-	-	-	-	-
Cladophora	+	+	-	+	+	-	+	+	-
Chlorococcum	-	-	-	+	-	+	+	-	+
Closterium	-	+	-	+	+	-	-	+	+
Cosmarium	-	-	-	-	-	-	+	+	+
Pediastrum	-	-	-	-	+	-	-	+	+
Scendesmus	+	-	-	+	-	-	+	-	-
Spirogyra	+	-	-	+	-	-	+	-	-
Ulothrix	-	-	-	+	-	-	+	+	-
Total No. of Genera	5	4	2	7	5	2	6	5	4
3. Cynophyceae									
Anabaena	-	-	-	-	-	-	+	+	+
Gloeocapsa	-	+	-	-	+	+	-	+	-
Microcystis	+	+	-	+	+	+	-	+	-
Nostoc	-	-	-	-	+	+	-	-	+
Oscillatoria	-	+	-	-	+	-	-	-	-
Srigonema	-	-	-	-	-	-	-	-	+
Spirulina	-	-	-	+	+	-	-	+	-
Total No. of Genera	1	2	0	2	5	3	1	4	3

70.75% in August and 77.75% in September. Minimum mean relative humidity was 17.98 in April.

Biotic Components

The following species were the common plants-

1. *Typha, Cyperus, Sagittaria* were found in the emergent zone. *Typha angustifoia* was dominant.
2. *Eichornia, Azolla, Utricularia* and *Wolfia* were found in the free floating species. *Azolla* and *Pinnata* were the dominant species and covered about 70% of this zone.
3. Algal species recorded during study period belonged to the classes of chlorophyta, bacillariophyta and cyanophyta.

Water analysis

Analysis of effluents was carried out by selecting appropriate methods[2].

Phytoplankton sampling and measurements

Phytoplankton samples were collected at monthly intervals between 8 A.M. to 10 A.M. on sampling day from all three investigation sites.

The content of the specimen tube was transferred to another specimen tube. Filtered and concentrated samples were preserved in 4% formalin for subsequent analysis. Plankton density was calculated by micro transect methods[4].

Each transect represented a definite fraction of the areas under the cover slip, hence a definite volume of the sample. The number of plankton per drop was calculated as follows :

$$\text{No of plankton per drop} = \frac{\text{Area of cover slip}}{\text{Area of transect x Average no. of Plankton}}$$

TABLE-2 : Monthly Variation in Phytoplankton Net Primary Productivity, Gross Primary Productivity ($mgCm^3$/hr) and Net Primary Productivity, Gross Primary Productivity Ratio in the year 2015

Months	Site-A			Site-B			Site-C			Average	Average	Average
	NPP	GPP	NPP/GPP	NPP	GPP	NPP/GPP	NPP	GPP	NPP/GPP	NPP (A+B+C)	GPP (A+B+C)	NPP/GPP (A+B+C)
January	096.7	132.8	0.73	125.4	161.4	0.77	148.4	182.3	0.81	123.5	158.8	0.78
February	098.9	138.0	0.71	130.2	153.6	0.85	156.2	208.3	0.74	128.4	166.6	0.77
March	099.7	134.8	0.74	136.4	183.7	0.74	164.0	210.9	0.78	133.4	176.5	0.76
April	104.9	127.6	0.82	138.0	187.5	0.74	177.0	237.0	0.75	140.0	184.0	0.76
May	104.1	125.0	0.83	141.0	192.5	0.73	182.3	226.5	0.80	142.5	181.3	0.79
June	109.2	136.0	0.80	141.6	193.6	0.73	184.9	244.5	0.75	145.2	181.3	0.76
July	080.7	111.9	0.72	114.0	153.6	0.74	127.6	171.8	0.74	107.4	145.8	0.74
August	078.1	114.5	0.68	111.9	138.0	0.81	125.0	161.4	0.77	105.0	138.0	0.76
September	065.1	093.7	0.69	106.7	125.0	0.85	122.4	148.4	0.82	098.0	122.4	0.80
October	083.7	114.5	0.73	110.5	138.8	0.79	132.0	187.5	0.74	109.0	146.9	0.74
November	085.9	098.9	0.86	122.4	148.4	0.85	138.0	187.5	0.73	115.4	144.9	0.79
December	088.9	122.8	0.72	128.8	169.2	0.76	141.0	153.6	0.92	119.6	155.2	0.27

Result and Discussion

The plankton density organism (O/L) was highest in the least polluted site-C in all seasons and the least in the most polluted site-A. The peak of the phytoplankton number was observed in June at all three sites. Which was 2108 OL^{-1} and Site-C 1956 OL^{-1} at Site-B and 1191 OL^{-1} at site. A minimum value of phytoplankton number were recorded in Sept. At all the tree sites. It was 119 OL^{-1} at Site-A, 167 OL^{-1} at site-B and 204 OL^{-1} at Site-C. The total number of genera recorded of was 16 at Site-A, 30 at site-B, 34 at Site-C during study period. Maximum number of 35 genera recorded in summer followed by 28 in winter and 17 in rainy season (Table-1)

The maximum rate of phytoplankton gross and net production followed same at all three sites. (Table-2).

- ❖ The maximum value of net productivity in the month of June. It was recorded at Site-B and Site-C.
- ❖ The minimum value of net productivity in the month of September at Site-B and Site-B and site-C.
- ❖ The maximum value of gross production was recorded at Site-C in the month of June.
- ❖ The maximum value of gross productivity recorded at Site-A in the month of September.

Phytoplankton population was highest at Site-C and lowest at Site-A. It is interesting to find out that large number of algal species were found both in polluted as well as less polluted sites.

It was noted that the diversity and the quantity of the algal species decreased with the increase in the load of pollution at different sampling sites. Wetland productivity of phytoplankton was least at Site-A and the pollution load was highest.

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