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Seasonal Dynamics of Phosphate Content in the Perennial Lentic Water Body of Chapra , Bihar

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ABSTRACT

In lentic environment, phosphate exhibited a marked seasonal variation in its concentration. At site 1, the lowest value was recorded in January, 2012 (0.019 mg/L) and February, 2013 (0.027 mg/L) while the highest in May, 2012, (0.245 mg/L) and April, (0.197 mg/L) during the first and second year respectively. Whereas, at site 2, the minimum and maximum phosphate concentration was observed in September, 2012 (0.418 mg/L) and April, 2012 (0.831 mg/L) during first annual cycle. While, in the second year it was in August, 2013 (0.493mg/L) and May, 2013 (0.823mg/L).

1. INTRODUCTION

Nature has an innate mechanism to maintain its purity after every natural use. But it is unable to do this at this at the rate at modern humans add dirt to it. Nature does not know how to deal with several toxins and pollutants that are flowing from industrial and other wastes therefore, humans are bound to monitor the import of this activity on natural freshwater continuously. Water maintains the balance of the ecosystem components on which other system depends. The ponds, lakes and reservoirs represent very complex and fragile ecosystems. Many small ponds in different parts of the world have been drained or reclaimed to extend arable land. This has caused unusual fluctuations in water land, the impact of which is tremendous. The aquatic organism and ecosystem in which they participate represent a substantial sector of the earth biological diversity. So, the fresh water habitats are considered worth while not only as a supply resources but as a living system by which the global ecosystem is balanced. Study of fresh water ecosystems and energy flow in such systems are quite timely. Such studies pave the way to prime regulatory mechanism for the ecosystem as a whole and may reveal both the rate and direction of whatever changes take place within the system. The biodiversity and dynamics of different phytoplankton population and their role in natural water cycle are one of the least explored areas in aquatic biology. All the developmental activities have immediate effects on various water quality parameters including biology. Studies on fresh water ponds and reservoir in our country have gained momentum in recent years. In India reservoirs which cover three million hectares of surface area considered the prime resources with regard to aquatic production potentials. The role and importance of phosphate in natural water is well reorganized. The phosphate is the raw materials for protein synthesis and thus is of great importance in the study of aquatic productivity. Ecologically phosphate is often considered to have direct influences on the growth of aquatic macrophytes. However, their high concentration can be attributed to the formation or accumulation of inorganic phosphate and also to the considerable addition of phosphate throughout agricultural runoff and sewage discharge from the adjacent areas.

2. MATERIALS AND METHODS:

All water samples were collected on fortnightly basis. The water samples for physico-chemical analysis were carried out for two years i.e from 2017to2019.The whole water analysis were made by soil and water analysis kit **model ;RI-362.** Phosphate-phosphorous was analysed colorimetrically by ammonium molybdate stannous chloride method.

3. RESULTS AND DISCUSSION

In lentic environment phosphate exhibited a marked seasonal variation in its concentration. At site 1, the lowest value was recorded in January, 2012 (0.019 mg/L) and February, 2013 (0.027 mg/L) while the highest in May, 2012, (0.245 mg/L) and April, (0.197 mg/L) during the first and second year respectively. Whereas, at site 2, the minimum and maximum phosphate concentration was observed in September, 2012 (0.418 mg/L) and April, 2012 (0.831 mg/L) during first annual cycle. While, in the second year it was in August, 2013 (0.493mg/L) and May, 2013 (0.823mg/L).

Table1 Showing the variation in Phosphate content of the lentic water body at Chapra, Bihar

2017	Site 1	Site 2
Oct	0.113	0.541
Nov	0.071	0.603
Dec	0.044	0.576
2018		
Jan	0.019	0.584
Feb	0.049	0.715
March	0.082	0.669
Apr	0.161	0.813
May	0.245	0.638

June	0.092	0.756
July	0.042	0.592
Aug	0.089	0.475
Sept	0.057	0.418
Oct	0.065	0.513
Nov	0.099	0.566
Dec	0.063	0.647
2019		
Jan	0.045	0.613
Feb	0.027	0.698
Mar	0.087	0.671
Apr	0.197	0.713
May	0.156	0.823
June	0.119	0.801
July	0.082	0.547
Aug	0.077	0.493
Sept	0.097	0.528

Phosphate is a key metabolic nutrient and ecologically, it is considered as the most critical single element, which regulates the productivity of natural waters. Although, phosphate is a minor constituent of water but its biological importance is well recognized as their higher concentrations respond to the greater plant production in water (Hutchinson, 1957; Lee,1970; Boyd 1979), in the contrary, loss of phosphate may be attributed to uptake by plants and bacteria (Hyens and Philips,1958), Munawar (1970) suggested that during oxygen deficiency of water body, phosphate is expected to be released in water from the bottom and Srinath and Pillai (1972) observed that concentration of phosphorous in water should be 0.05 mg/L for the control of algal growth. George (1976), opined that concentration of phosphate is influenced by zooplankton, which may excrete appreciable amount of phosphorous in water. While, importance of phosphate in natural waters has been stressed by various workers (Juday et.al. 1938; Ohle, 1934, Michael, 1969; Munawar,1970; Khan and Sidiqui, 1974 and Agrawal, 2001. Several workers have observed different range of phosphate content in freshwater. Moyle(1946**) gave the phosphate fertility range of aquatic productivity as nil- 0.02 ppm low, 0.02-0.05 ppm fair, 0.05-0.10 ppm good, 0.10-0.20 ppm for excessive production. While, the Indian water, Banerjea(1969) suggested that the water bodies with dissolved phosphate 0.05 ppm were claimed to be unproductive, whereas those of 0.20 ppm were productive**. If at all the above classification of Banerjea(1969) is taken into consideration, the water bodies investigated were may be placed under productive category. Hussainy(1967) observed that phosphate content in a tropical lake waters varied from traes to 0.17 mg/l, which was similar with those of Ganapati(1960) and Sreenivasan(1964) Sahai and Sinha(1969), reported that phosphate ranged between 0.018 to 0.09 ppm in a lake at Gorakhpur. Balkhi et.al (1987) observed the phosphate ranged from 0.004 to 0.073 ppm in Anchar lake at Kashmir, Singhal et. al 1987 gave the range of phosphate from 0.20 to 0.56 ppm in a pond at Haryana. Roy et.al (2009) gave the similar range at Kanwar lake Bihar. During the present study, phosphate concentration varied from 0.019 to 0.245 mg/l at site1, and 0.418 to 0.823 mg/L at site2. The present findings indicate that the phosphate concentration was low during monsoon months, which could be due to its dilution in the accumulated rain and flood water added to the water bodies from the catchment area. Hussainy(1967) also observed the low phosphate concentration during monsoon season. While, at site 1, phosphate content was low in winter months, which confirms the findings of Sahai and Sinha(1969). On the contrary, rain and flood water carrying more phosphate contents into the water and are possible the major contributory factors for raise of phosphate during monsoon months (Lakshaminarayana,1965; Pahwa and Mehrotra,1966). The higher phosphate concentration was observed during summer months which may be attributed to the discharge of more concentrated sewage effluents into water and also due to higher rate of evaporation which causes increase in the concentration. Many investigator including Hussainy (1967) have also noted the summer high phosphate concentration.

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