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Nutrient dynamics in relation to discharge of sewage in Winganga River water at Pauni, District Bhandara (M.S.), India

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Abstract

The significant sources of organic pollution enhance nutrient contents in the river water. Nitrogen, phosphorous and silicates play very important role in the biological activities of aquatic environments, such as the abundance of vegetation and faunal status. The Wainganga river water at Pauni town is analyzed for nutrient concentrations their inputs and rate of assimilation by organisms. Phosphate concentration ranged from 0.91 mg/l to 2.29 mg/l, ammonia nitrogen ranged from 0.32mg/l to 1.48 mg/l , nitrate nitrogen ranged from-, nitrite from 2.88 mg/l to 7.64 mg/l.

Keywords:*Phosphate, Nitrates, Oxygen, river water*

Introduction

Dissolved nutrients in water play a very important role in the metabolism of aquatic fauna. Nutrients in a lotic system originate from the geological and metrological pathways. In addition to it the sources of organic pollution in the water bodies' builds major nutrient input system in to the running waters. In natural waters phosphorus occurs principally as inorganic orthophosphate. During summer, the phosphate split in to two parts. In the waters biological activity is intense resulting in depletion of orthophosphate phosphorus. However, the deeper water gain phosphate, as phosphate is richly present in detritus falls and is decomposed by bacteria. In water phosphorus occurs in a numerous forms such as particulate form, active phosphate, orthophosphate and organic phosphates in both soluble and insoluble fractions. In polluted water bodies the organic phosphates plays main role in the biological activities.Though the less concentration of phosphorus is one of the important nutrients limiting growth of autotrophs and so biological productivity of the system. Phosphorous as such is not harmful to the organisms. The quality criterion for phosphorus in water is only to Check nuisance growths of algae and process of eutrophication, (Balls *et al.*, 1996).

Nitrogen forms a major constituent of atmosphere. It occurs I small amount in water due to low solubility of molecular nitrogen in biosynthesis. Beside this nitrogen is also found in small quantity in water, in bounded forms such as ammonia, nitrates, nitrites and organic nitrogen such as urea, amino acids, nucleic acids etc. Nitrate is the most highly oxidized form of nitrogen compound, commonly present in natural waters, because it is the product of nitrogenous organic matter. (Ajmal, 1985).Ammonia is liberated in the water as an end product of decomposition of nitrogenous organic matter and also as an excretory product of some aquatic animals. Domestic wastes are generally rich in nitrogenous organic matter. Many industrial effluents add to the ammonia load in water, resulting in toxic levels at certain times. The ammonia released by bacterial action o0n organic matter may be used by plants directly to produce plant proteins. The excess of ammonia released is oxidized by autotrophic nitrifying bacteria, which convert ammonia to nitrites under aerobic conditions.

Material and Methods

The river water is continuously polluted mainly due to human activities on the bank of river and input of domestic sewage. Though the activities are limited

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at any one specific spot, the pollution caused does not remain confined to the spot, but contaminates whole stretch of river. In view of various domestic activities and drainage points of municipal channels in the river, four stations are selected. Station S1 is located far away from the localities of the town and considered to be pollution free, while station S1, S2 and S3 receives the pollutants in river water. The all parameters are performed with the standard methods given by NEERI, (1986).

Results and Discussion

Ammonia

Biological degradation of organic matter results in to the production of ammonia in river water. However, during winter, the reduced activities of nitrifying bacteria due to low temperature of water, causes max values of ammonia in water. In the months of rainy season, the large quantity of water in river basin dilutes the biodegradable wastes' hence the lower values are recorded,(Muller & Kirchesch, 1990).The data recorded during the summer reveals that the concentration of biodegradable organic matter in river water is more in summer. High tempt of water enhance the decomposition activities of microbes. On the other hand activity of nitrifying bacteria also increased due to increased tempt. of water in summer, which converts the ammonia in to inorganic nitrogen and causes the reduction of values on some extent.Anaerobic decomposition of bottom organic matter and dissolved organic matter by microbial population and increased activities of denitrifying bacteria in the lower temperature of river water during winter increase the values of ammonia and hence the max values were obtained in winter, (Bandela *et al*, 1999).High tempt of water dissociates the most of ammonia dissolved in water in summer thus ammonia evolved find its way to atmosphere. Hence the lower level of ammonia is recorded in the summer as compared to the values obtained in winter.Municipal discharge at station S2 and S4, domestic activities performed by localities at station S3 and S4 and discharge ofdecaying leaves and flowers from temples and dead bodies contributes the organic matter in river water. However, the sewage discharge at station S2 showed the impact of pollution at station S3 due to less distance between these stations.The max permissible level of ammonia in water for domestic use is 0.5 Mg /l. in Wainganga river water it is well above the permissible level.

Phosphates

Phosphates and nitrates are the contents of domestic sewage. Present study of Wainganga river water reveals that the concentration of phosphate is maximum in the month of summer and winter, while minimum during the rainy season. The municipal sewage, domestic wastes and temple wastes constitutes the source of organic matter in the river water and enhance the microbial activities. It leads in to the concentration of phosphates.,Koshy and Nayar, (2000) has recorded similar findings.The domestic activities on the bank of river by locality, results in to the increase of phosphate concentration. In river basin farming the use of cow and pig dung manure during summer season pollute the river and constitute the sources of phosphate in river water at station S2 and S3, (Verga *et al.*, 1990).During winter season the lower level of phosphate may attribute to abundance of phytoplankton in river water.

Assimilation of phosphates by phytoplankton population is responsible for the decrease in the level of phosphate in winter. In the months of rainy season dilution of poliutants lowers the concentration of phosphates. At station S4 increases the concentration of phosphates. The phosphate concentration in Wainganga river increase from upstream station S1 to down stream station S4.

The permissible potability level of phosphates led down by WHO is 0.1 Mg/l in the present investigation it is observed that the phosphate level is above the permissible limit.

Nitrates

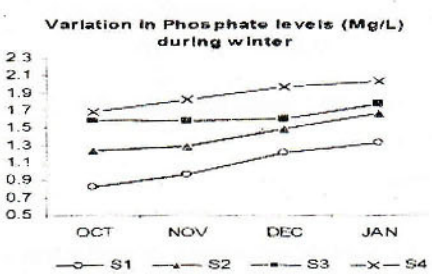
As a result of present study it is concluded that the concentration of nitrate remains maximum during summer season and minimum during rainy season, (Sharma & Pande, 1998). The pertinacious organic matter present in the sewage and other wastes, on decomposition result in to the formation of ammonia. The increased activity of nitrifyingbacteria in a high temp of river water causes the increase inthe values of nitrates during summer season, (Rath *et al.*, 2000). Due to discharge of sewage and domestic wastes and less flow of water in the river results in to the turbidity. This may influence some extent to the

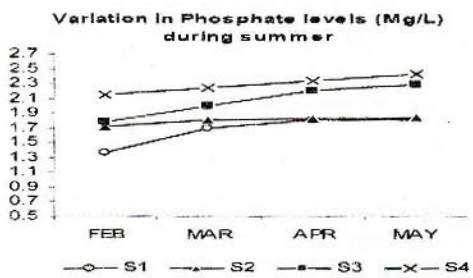
photosynthetic activities of up take of nutrients by phytoplankton.The abundance of phytoplankton population and activities of denitrifying bacteria causes the lower values of nitrates during winter. Subsequently the relatively more quantity of water in river in the months of winter dilutes the pollutants to some extent and the decreased activities of microbes in lower temp of water are the reasons of decreased levels of nitrate in river water.

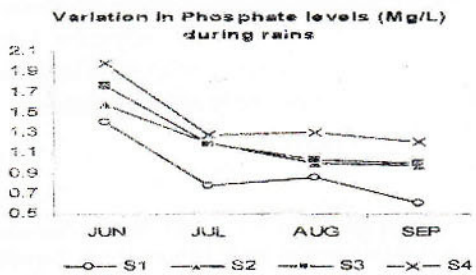
Similarly during rainy season dilution of sewage and wastes in more quantity of river in the flooded water decrease the level of nitrates.Since there is no significant source of pollutants at upstream station the nitrate concentration is min at these stations. In Wainganga water the concentration of nitrates increased from up stream station to down stream station with increasing load of pollutants. At station S4 many sources of organic pollutants leads to increase the levels of nitrates.

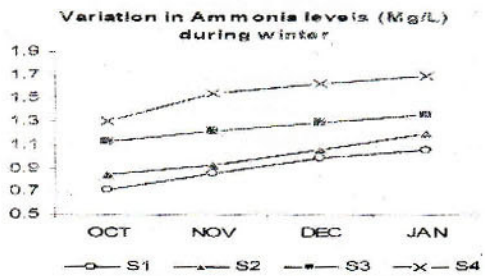
Table: 1 : Mean values of nutrient and Dissolve gases concentration in Wainganga river

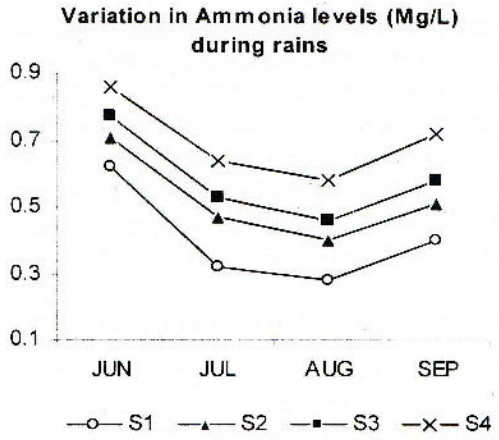
		S1	S2	S3	S4
Phosphates	Summer	1.66 ± 0.41	1.8 ± 0.31	2.07 ± 0.2	2.29 ± 0.31
	Winter	1.09 ± 0.17	1.43 ± 0.29	1.64 ± 0.21	1.89 ± 0.31
	Rains	0.91 ± 0.38	1.13 ± 0.2	1.25 ± 0.3	1.44 ± 0.35
Ammonia	Summer	0.5 ± 0.06	0.63 ± 0.04	0.75 ± 0.04	0.91 ± 0.07
	Winter	0.84 ± 0.05	0.95 ± 0.06	1.28 ± 0.13	1.48 ± 0.12
	Rains	0.32 ± 0.03	0.45 ± 0.02	0.5 ± 0.06	0.58 ± 0.05
Nitrates	Summer	3.31 ± 0.26	7.08 ± 0.42	7.29 ± 0.73	7.64 ± 0.66
	Winter	2.97 ± 0.28	6.12 ± 0.36	6.49 ± 0.78	6.55 ± 0.83
	Rains	2.88 ± 0.25	5.03 ± 0.36	5.2 ± 0.4	5.32 ± 0.45
D.O.	Summer	5.23 ± 0.34	4.9 ± 0.54	3.95 ± 0.61	3.63 ± 0.46
	Winter	7.93 ± 0.25	6.1 ± 0.3	5.0 ± 0.23	4.7 ± 0.48
	Rains	5.78 ± 0.3	5.05 ± 1.1	4.55 ± 0.52	4.38 ± 0.48
CO_2	Summer	9.14 ± 0.86	14.37 ± 1.1	16.24 ± 1.4	22.97 ± 2.6
	Winter	7.77 ± 1.3	10.21 ± 1.9	14.8 ± 2.24	21.1 ± 1.99
	Rains	3.75 ± 1.1	5.69 ± 0.69	11.97 ±1	19.7 ± 1.12

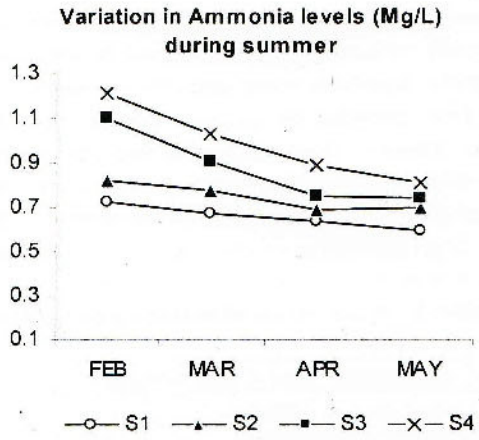


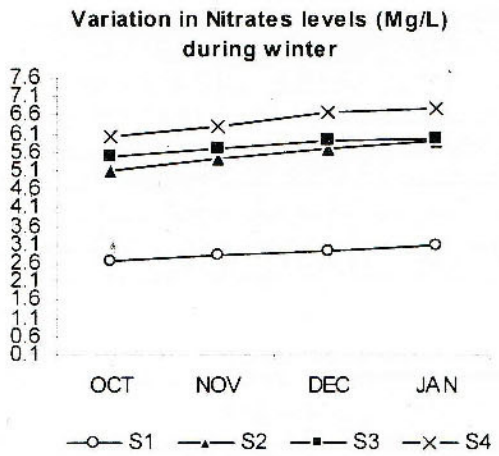


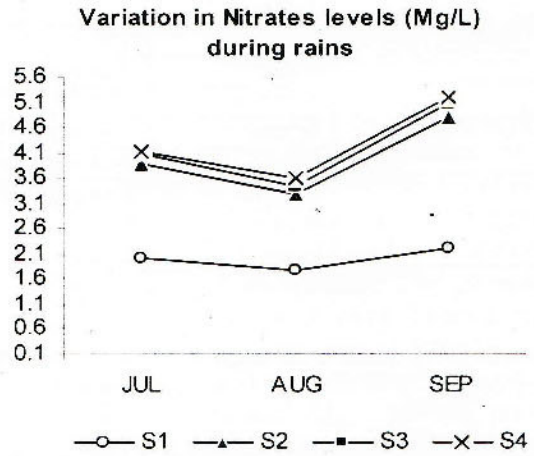


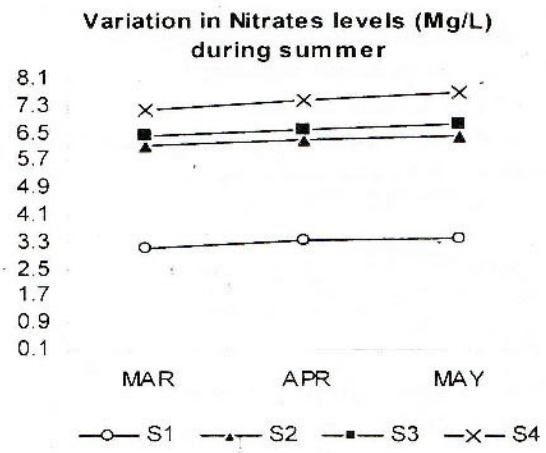












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