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Chemico analytical study of phosphorus and nitrogen content in hospital waste effluent with emphasis on nutrients loading

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ABSTRACT

A pollutant is nothing but a misplaced resources. It is very true in case of nutrient. Excessive fertilization of natural water is becoming one of the most important causes of water quality-deterioration. Hospital effluent contains Nitrogen, Phosphorus, Ortho Phosphate, Organic Phosphate, Ammonia etc. which stimulated the growth of flora. When these partially treated or untreated hospital effluents find their way into water bodies they increase the amount of nutrients. Now a day the Eutrophication has become a threat of the existence of water bodies.

Key words: Phosphorous, nitrogen content, Hospital waste effluent, Nutrient loading.

INTRODUCTION

Eutrophication is a process, which means well nourishment or enrichment. This enrichment leads to abundant bottom vegetation, algal blooms and a decreased population of fauna due to nitrogen depletion. Nitrogen and Phosphorous are tow important nutrients that lead to eutrophication and convert oligotrophic water to intensly nutrients productive eutrophic condition. Oligrotrphic lakes are relatively unproductive and receive small amounts of aquatic plant nutrient, while eutrophic lakes are highly productive and experience high fluxes of aquatic plant nutrients. Hospital effluent of some hospital which are situated in different locations of Bhopal city has been analyzed to determine the amount of nutrients by following the standard method prescribed by APHA. Anonymous (1961), Hasler (1970), Hutchinson (1957,1967) and Sauyer (1966) studied the eutrophication of lakes in different parts of the world. Eutrophication can be classified into a) Natural Eutrophication and b) Cultural Eutrophication on the basis of process by which the eutrophication took place. When lakes and other surface water bodies receive nutrients naturally, eutrophication is knows and Natural Eutrophication on the other hand lake aging by human activities known as cultural or artificial Eutrophication. In India Kashmir lakes and Nainital lake are undergoing a rapid Eutrophication.

Study area

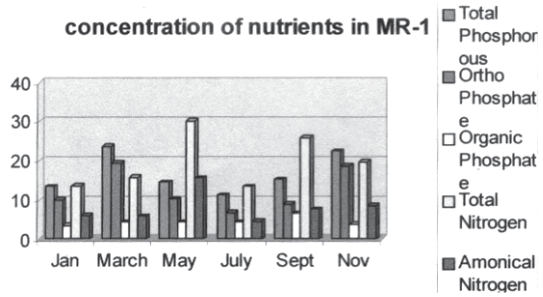
MR1 Govt. Sultania Lady Hospital, Bhopal
MR2 Govt. Hamidia Hospital, Bhopal
MR3 Govt. Jaiprakash Hospital, Bhopal
MR4 Govt. Khan Shakir Ali Khan Hospital, Bhopal
MR5 Govt. Jawaharlal Nehru (Gas Tragedy) Hospital, Bhopal

MATERIAL AND METHODS

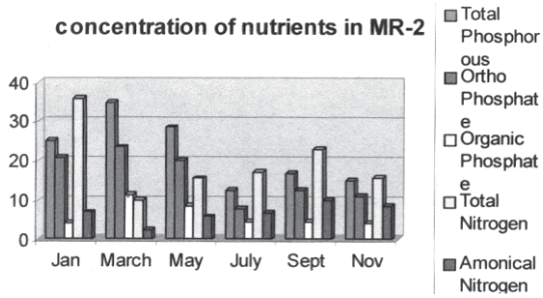
Sampling of Hospital effluents carried out on bimonthly basis in the morning. The Standard methods as prescribed by APHA (1995). Adoni (1985) and NEERI (1986) were followed during the collection, preservation and analysis of samples. Nitrogen is analysed by Kjedahl's method. Total phosphorous and Ortho Phosphate was read analyzed by ammonium molybdate method and intensity of developed colour was read by UV-Visible spectro-photometer [HACH DR 4000 U]. Ammonical Nitrogen was analysed by multi-parameter kit"WTW" with the help of electrodes.

RESULTS AND DISCUSSION

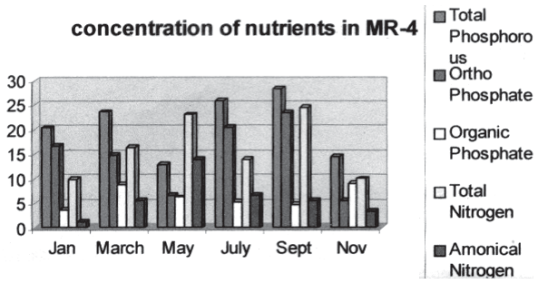
The results are summarized in table 1 and graph 1-5 are showing the comparative representation.



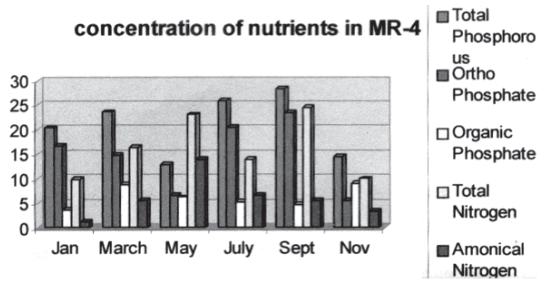
Graph 1:



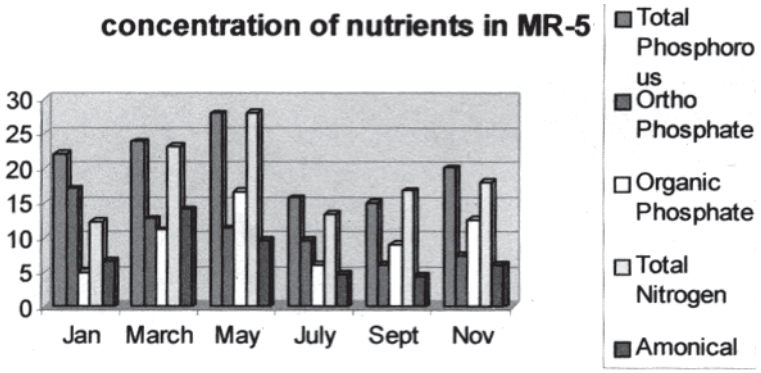
Graph 2:



Graph 3:



Graph 4:



Graph 5:

Table 1: Obserbation

Sampling point↓	Amount of Nutrients→				
	Total phosphorous	**Ortho phosphorous**	**Organic phosphorous**	**Total nitrogen**	**Amonical nitrogen**
MR5					
Jan	13.40	09.90	3.47	13.61	06.10
March	23.49	19.19	4.29	15.76	05.72
May	14.41	10.04	4.39	30.07	15.49
July	11.12	6.75	4.32	13.41	04.50
Sep	15.08	08.84	6.50	25.80	07.54
Nov	22.41	18.53	3.84	19.52	08.51
MR2					
Jan	25.06	20.83	4.25	35.89	06.83
March	34.83	23.46	11.37	09.83	02.24
May	28.44	19.91	8.55	15.51	05.82
July	12.42	07.82	4.62	17.10	06.74
Sep	16.82	12.41	4.43	22.83	10.02
Nov	15.02	11.04	4.03	15.63	08.55
MR3					
Jan	11.12	07.30	3.82	16.74	08.46
March	14.62	08.82	5.82	33.51	14.52
May	26.10	20.67	5.46	27.34	07.07
July	23.57	18.65	4.90	25.82	16.08
Sep	13.47	03.42	10.0	11.06	03.37
Nov	12.34	07.66	4.72	16.79	09.74
MR4					
Jan	20.32	16.65	3.67	09.83	01.25
March	23.49	14.65	8.84	16.38	05.52
May	12.83	06.67	6.20	23.05	14.040
July	25.76	20.44	5.31	14.04	06.53
Sep	28.27	23.50	4.78	24.51	05.54
Nov	14.52	05.48	9.05	10.03	03.28
MR5					
Jan	22.04	17.02	5.07	12.33	06.56
March	23.72	12.68	11.07	23.10	14.06
May	27.82	11.33	16.65	28.01	09.64
July	15.65	08.54	6.14	13.43	04.62
Sep	15.08	06.04	9.08	16.82	04.48
Nov	20.02	7.50	12.50	17.99	06.02

Total phosphorous (TP)

During the course of study TP is found between range 11.10 to 34.80 gm/L. Minimum value of TP if found in January at sampling station MR3 and in the month of July at sampling point MR1. Where as maximum concentration is reported at sampling point MR2 in month of March.

Ortho phosphate

Ortho phosphate plays a dynamic role in plants growth and it is readily taken by phytoplanton. In present study concentration of ortho phosphate is observed 05.46 to 23.48 gm/L. Higher concentration is recorded in the month of May at sampling point MR4 and lowest amount is recorded in November at sampling point MR4.

Organic phosphate

Amount of Organic phosphate is reported minimum (03.48 gm/L) at sampling point MR1 and maximum amount of organic phosphate is recorded (16.46 gm/L) at sampling point MR5.

Total nitrogen (TN)

Total nitrogen is an important factor which enhances the growth of flora. The amount of TN is lowest at sampling point MR4 in month of January which is 09.80 gm/L and highest amount is recorded at sampling point MR2 in the same month which is 35.90 gm/L.

Ammonical nitrogen

In present analysis minimum concentration of ammonical Nitrogen is recorded at sampling point MR4 in January where as maximum concentration is reported at sampling point MR3 in July. Concentration ranged fom 01.25 to 16.06 g/L.

Alage and diatoms attains high degree of dominance due to over fertilization. During eutrophication algal blooms release toxic chemicals which kills fishes, birds and other aquatic animals causing water to shrink. Alage and rooted weeds retard the water flow clog the filters and affect the water quality and water work. Prolonged eutrophication conditions leads to dystrophic state. In India Dal, Nagin and Hussain sagar are seriously chocked by aquatic weeds.

Several techniques along with prevention of further inflow of effluents have been used to control eutrophication. The hospital effluents must be treated discharge into water streams to limit the nutrient value. Recycling of nutrient can be checked through harvest. Algal blooms should be removed upon their death and decomposition. Physicochemical method can be adopted to remove dissolved nutrients.

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