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Eutrophicatin through agricultural runoff in kaliasote reservoir of Bhopal (M.P.)

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ABSTRACT : The use of chemical fertilizers in the catchment area of the Kaliashote reservoir has increased many fold thus, residual impact of the chemical fertilizer as well as agriculture waste inflow in the lake considerably increased water pollution problem. The residues of the chemical fertilizer reaching to the Kaliashote reservoir with storm water enriched the lake water with the loading of nutrients. The extra loading of the nutrient causes eutrophication that supports luxuriant growth of macrophytes. Results of analyzed of several physicochemical parameters such as pH, Conductivity, Dissolved Oxygen (DO), Biochemical Oxygen demand (BOD), Chemical Oxygen demand (COD), Nitrates, Phosphates and Potassium shows high concentration of nutrients in the areas where chemical fertilizer are being used (at the station Chandanpur near Kolar) in comparison Reference sample i.e. Behind MACT, Kaliasote Reservoir.

Keywords : Eutrophication, Chemical Fertilizers, Organic Fertilizers, Water Quality.

I. INTRODUCTION

The Kaliasote reservoir is situated near the Water and Land Management Institute (WALMI) Bhopal, and was constructed as a storage dam to conserve excess water of Upper Lake, discharged through the Bhadbhada spill gates of the lake for irrigation purposes. The reservoir is having a catchment of 381.38 Km^2 and the gross capacity is 35.387 Mecum. The reservoir is also facing the problem of siltation due to rapid change in land use pattern from agriculture to housing. The catchment area is surrounded by agriculture land where fertilizers and pesticides are being used. Under present investigation two sampling stations were identified one at Chandanpur near Kolar where Chemical Fertilizers are being used and the other one at Reference sample *i.e.* Behind MACT .

II. MATERIAL AND METHODS

Water samples were collected in fresh 2.5 L plastic containers previously washed with 1 : 3 HNO_3 during the post monsoon months i.e. September-2010 from surface and bottom water.

pH was determined using digital pH meter. Conductivity was measured using digital conductivity meter. Dissolved Oxygen was determined by the Wrinkler's method with Azide modification. Biochemical Oxygen Demand was determined by five days method . Chemical Oxygen Demand determined by Potassium Dichromate Pen Reflux method. Nitrate & phosphate were estimated by UV-visible Spectrophotometer. Potassium was determined by using Flame Photometer.

III. RESULTS AND DISCUSSION

Water quality standards and guidelines corresponding to the ISI ,WHO, CPCB have been compared with the results under the given tables and graphs.

pH and Conductivity: pH is largely depend on carbonates, bicarbonates, CO_2. The results of pH ranged in between 7.1 – 7.6 indicating that the lake water is slightly alkaline. Desirable pH range is 7.0 – 8.5 as per WHO, ISI. Conductivity is depended on SO_4,Cl, PO_4 and heavy metals and total concentration of dissolved ions. The results of analysis in between 269-768 micro-ohms/cm. The conductivity standard value is 50-1500 micro-ohms/cm.

Dissolved Oxygen (DO): DO in water is of great importance to all aquatic organism and is considered to be the factor that reflects the biological activity taking place in a water body and influences the biological changes. In the present study DO values were found in between 3.2 – 8.8 mg/L against the standard value of 6.0 mg/L.

Biochemical Oxygen demand (BOD): BOD is directly linked with decomposition of dead organic matter present in the lake and hence the higher values of BOD can be directly co-related with pollution status and has an inverse relation with DO concentration. The BOD values were observed in between 1.2 – 7.2 mg/L. The permissible limit is 3 – 6 mg/L.

Chemical Oxygen demand (COD): The range of COD was observed in between 30-52 mg/L while the permissible limit is 10.0 mg/L.

Nitrate (NO_3), phosphate (PO_4) and Potassium : Nitrate and phosphate are two important nutrients in the lake for eutrophication process. These nutrients support the fast growth of aquatic plant. In the present study, the results of nitrate in between 1.16-2.69 mg/L. and results of phosphate

was in between 1.33-2.56 mg/L. This range were observed exceeds the permissible limit because excessive use of chemical Fertilizers. Potassium ranged in between 18.0-35.0 mg/L. The values were observed beyond the permissible limit.

Table I : Concentration of physicochemical parameters of different Sampling stations of Kaliashote reservoir.

Sampling Station (Kaliashote reservoir)	Water Type	PHYSICO-CHEMICAL PARAMETERS							
		pH	Conductivity (m.ohm/cm)	DO (mg/L)	BOD (mg/L)	COD (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Potassium (mg/L)
S1-Chandanpur near Kolar	Surface	7.5	568	6.4	0	52	2.69	2.47	34
	Bottom	7.2	634	4.4	6	40	2.44	2.56	35
S2-Reference sample i.e. Behind MACT	Surface	7.6	269	8.8	4	38	1.16	1.33	19
	Bottom	7.1	363	3.2	10	30	1.18	1.87	18

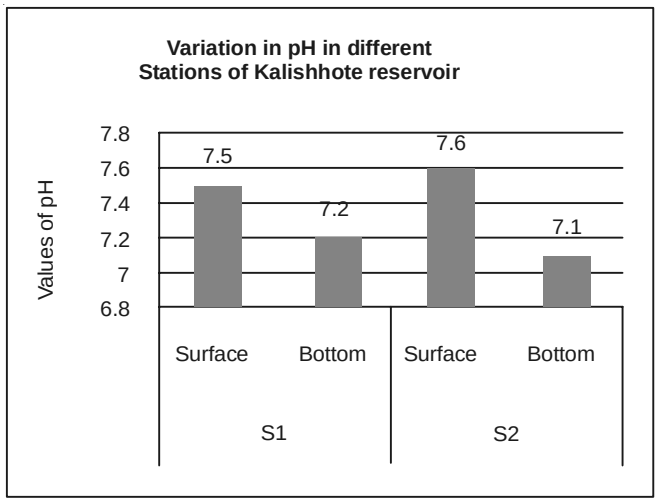

Fig. 1.

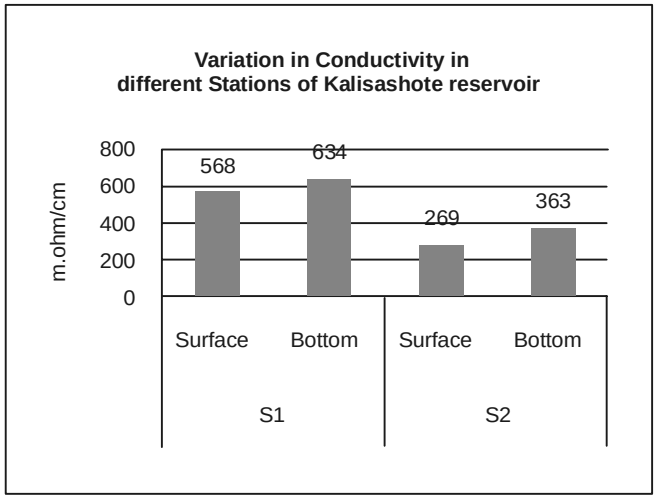

Fig. 2.

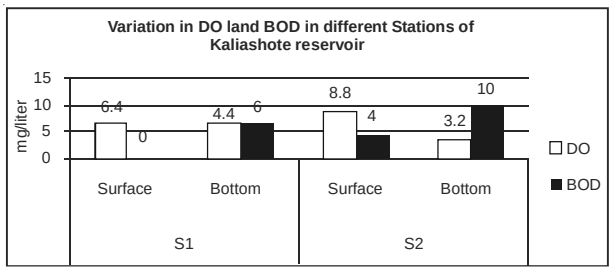

Fig. 3.

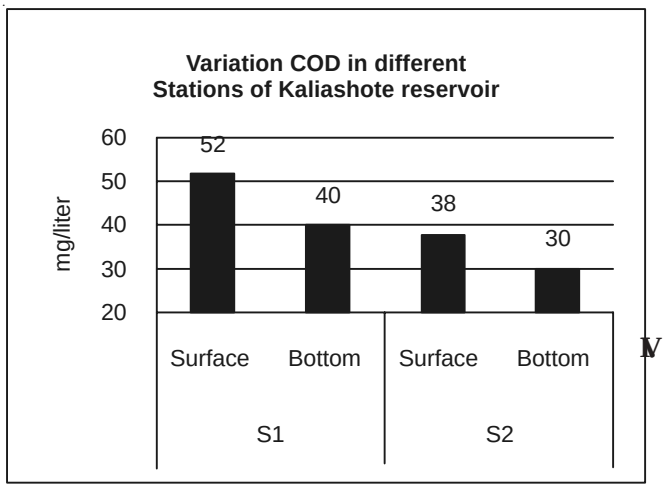

Fig. 4

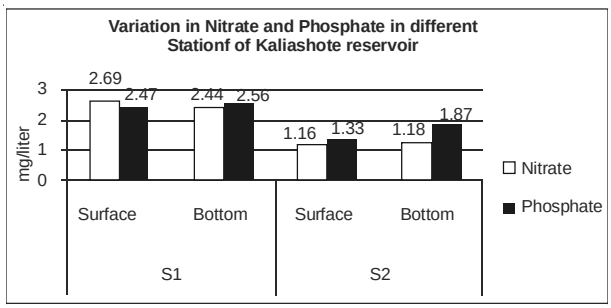

Fig. 5.

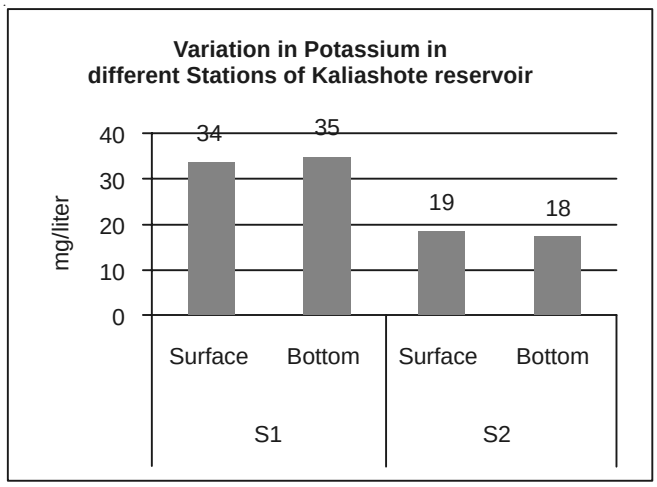

Fig. 6.

CONCLUSION

The comparative analysis depicts that, higher concentration of nutrients both nitrates as well as phosphates in the water samples of Chandanpur near Kolar which is being predominantly cultivated with chemical fertilizers especially with Urea, DAP, Super Phosphate etc. The availability of the higher concentration of nutrients in water due to intensive use of chemical fertilizer in the catchment area of the reservoir would accelerate the process of eutrophication. The water samples collected from Reference sample i.e. behind MACT, Kaliasote reservoir has comparatively lower concentration of nutrients . Thus, the present study recommends the use of organic fertilizer in place of chemical fertilizer which would not only improve the soil fertility but also help in reducing the enrichment of nutrients the reservoir water because of chemical fertilizer.

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