



SEDIMENT QUALITY ASSESSMENT OF AVARAGERE LAKE, DAVANAGERE CITY - A CASE STUDY

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Abstract — Avaragere Lake in Davangere was studied for chemical and physical parameters at five locations, for a period of six months (April 2014 to Sep 2014). Lake has been subjected to human interferences regularly and water quality was to be getting deteriorated profoundly. Major anthropogenic activities practiced in and around the stretch: agriculture, discharging of sewage waste etc was generating serious threat to the biota of the lake by altering the physical, chemical and biological concentration of the lake system. The other possibility is that since there are no major industries in the project area, the major source of organic pollutants is only the domestic source.

Monthly data's been collected. Different parameters studied were pH, Conductivity, organic carbon, nitrogen, phosphorus, potassium, zinc, copper, iron, organothiophosphate and pyrethroid content. The results obtained from the above study indicate that the water of Avaragere Lake organothiophosphate and pyrethroid content shows very low concentrations even at nanogram. Manganese and iron concentrations of sediment sample in avaragere lake shows high level of pollution and ecological balance of Lake is totally disturbed.

Keywords — pH, Conductivity, organic carbon, nitrogen, phosphorus, potassium, zinc, copper, manganese, iron, organothiophosphate, pyrethroid content.

I. INTRODUCTION

Soil erosion (especially from agricultural activity) is considered to be the leading global cause of diffuse water pollution, due to the effects of the excess sediments flowing into the world's waterways. The sediments themselves act as pollutants, as well as being carriers for other pollutants, such as attached pesticide molecules or heavy metals.

The effect of increased sediments loads on aquatic ecosystems can be catastrophic. Silt can smother the spawning beds of fish, by filling in the space between gravel on the stream bed.

Sediment contamination is a pervasive environmental problem that threatens aquatic ecosystems worldwide. Once released into surface waters, many toxic and persistent contaminants become adsorbed to sediment and can become incorporated into aquatic food webs. In this manner, contaminated sediments can have toxic and bio accumulative effects on aquatic life contaminants in aquatic ecosystems.

II. IMPORTANCE OF THE PRESENT STUDY

Davangere is a district head quarter situated in central part of Karnataka with a population of around 5 Lakhs. There are three major lakes in and around Davangere city. These are Bathi Lake, Kundawada Lake and Avaragere Lake. Avaragere Lake is located at 14.466° N latitude, 75.9242° E longitudes, is one of the important sources of irrigation water supply. The Lake is at the alarming state of water pollution and eutrophication. The ecosystem of Avaragere Lake supported many activities such as irrigation, discharge of domestic sewage, sediment deposit, causing a serious problem in its trophic state cited by a mainly rural area, human impact to the lake is expressed first of all as eutrophication. Pollution to the Avaragere Lake comes mainly from Ramanagar sewage entry in to the lake. For preventing diseases and improving quality of life. It is necessary to know details about different chemical parameters such as pH, conductivity, organic carbon and Fertilizer and trace metals contents (N,P,K and Zn,Cu,Mn,Fe) in sediment sample, to determine the Organothiophosphate and pyrethroid (cypermethrin, dimethoate, fenvalerate, malathion, manocrotophos) in water sample.



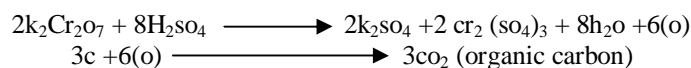
Fig 1 Location map of Avaragere Lake in davangere district.

III. METHODOLOGY

METHODS

- Determination of sediment pH. **Method-** electrometric,
- Determination of sediment electrical conductivity. **Method-** conductivity meter with measuring cell.
- Estimation of organic carbon in sediment

Organic carbon is determined by treating the sediment sample with a known amount of potassium dichromate ($K_2Cr_2O_7$) in presence of concentrated sulphuric acid (H_2SO_4) oxidation of organic carbon by ($K_2Cr_2O_7$) takes place as per the given reactions.



- Estimation of total kjeldhal nitrogen in sediment, **Method-** titrimetric method (Jackson ml, 1967)
- Determination of Phosphorus In Sediment

The available phosphorus is extracted in the solution. It is estimated by converting it to Phosphomolybdate complex. The phosphomolybdate complex is reduced by using reducing agent like ascorbic acid. The reduced phosphomolybdate complex is blue in colour. The blue colour is measured using spectrophotometer.

- Determination of sediment potassium, **Method-** Flame photometer (jackson ml 1967), is 101581982

MICRONUTRIENT ANALYSIS IN SEDIMENT

- **D.T.P.A Extractable Micronutrients (Zinc, Copper, Manganese, Iron)**

DTPA (Diethylenetriaminepentaacetic acid) is a widely used chelating agent, which combines with free metal ions in the solution to form soluble complexes of elements. To avoid excessive dissolution of $CaCO_3$, which may release occluded micronutrients that are not available to crops in calcareous sediments and may give erroneous results, the extractant is buffered in slightly alkaline pH. Triethanolamine (TEA) is used as buffer because it burns cleanly during atomization of extractant solution while estimating on AAS. The DTPA has a capacity to complex each of the micronutrient cations as 10 times of its atomic weight. The capacity ranges from 550 to 650mg/kg depending upon the micronutrient cations.

- **To determine the Organothiophosphate and pyrethroid contents (cypermethrin, dimethoate, fenvalerate, Malathion, manocrotophos) of water sample at selected points in Avaragere Lake.**

The pesticides are vaporized and moved through the column by the carrier gas. They travel through the column at different rates, depending on differences in partition coefficients between the mobile and stationary phases. As each component passes through the detector a quantitatively proportional change in electrical signal is measured on a strip chart recorder. Each component is observed as a peak on the recorded chart. The retention time is indicative of the particular pesticide and peak height or peak area is proportional to its concentration. Variables may be manipulated to obtain important confirmatory data. For example, the detector system may be selected on the basis of the specificity and sensitivity needed. The detector used in this method is an electron capture detector that is very sensitive to chlorinated compounds. If sufficient pesticide is available for detection and measurement, confirmation by a more definitive technique, such as mass spectrometry, is desirable. Chromatography is the most widely used technique for the analysis of non-inorganic mixtures. Gas chromatography (where the sample must be volatilized) and liquid chromatography (where the sample can be determined in the liquid state) are the most common methods in general use. High performance liquid chromatography (HPLC) is the method of choice whenever the sample cannot easily be converted to the gas phase.

TABEL1.THE STANDARD SOLUTION WAS SERIALLY DILUTED TO PREPARE CALIBRATION STANDARDS.

SL.NO	PESTICIDE STANDARDS	SIGMA ALDRICH CAT NO:	SOLVENT
1	MONOCROTOPHOS	36173-100MG	ACETONITRILE
2	DIMETHOATE	45449-100MG	ACETONITRILE
3	CYPERMETHRIN	36128-100MG	ACETONE
4	MALATHION	36143-100MG	ACETONE
5	FENVALERATE	45495-250MG	ACETONE

IV. TESTS AND RESULTS

This chapter briefly presents the results of the sampling and analysis of the samples. Discussions on 10 sediment quality parameters have been given. Analysis and discussion on chemical parameters are also included. Sampling was done in the Lake in a month from April 2014 to sep 2014. For better understanding and analysis of the results, tables and necessary graphs have been included. Sediment samples were collected and analyzed for different chemical parameters from 5 sampling stations located in Avaragere Lake. Since there is large number of scattered values.

A. pH

TABLE 2.PH RECORDED AT FIVE STATIONS

MONTH	S-1	S-2	S-3	S-4	S-5
APRIL 5 TH	7.8	7.9	7.8	7.9	7.9
MAY 7 TH	7.9	8.0	7.8	7.9	7.8
JUNE 6 TH	7.9	7.8	7.8	7.8	8.0
JULY 1 ST	7.3	7.4	7.4	7.3	7.4
AUG 10 TH	7.3	7.4	7.4	7.4	7.4

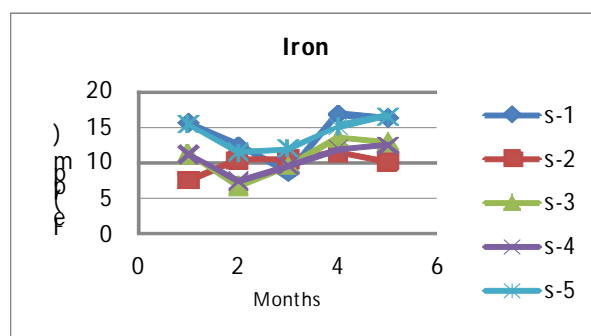


Fig 2.Variation of pH at 5 Stations

B. ELECTRICAL CONDUCTIVITY

TABLE 3.EC (ELECTRICAL CONDUCTIVITY) RECORDED AT FIVE STATIONS

MONTH	UNITS	S-1	S-2	S-3	S-4	S-5
APRIL 5 TH	µmhos/cm	0.1	0.1	0.1	0.1	0.1
MAY 7 TH	µmhos/cm	0.29	0.15	0.29	0.1	0.25
JUNE 6 TH	µmhos/cm	0.15	0.25	0.29	0.1	0.25
JULY 1 ST	µmhos/cm	0.1	0.14	0.11	0.1	0.1
AUG 10 TH	µmhos/cm	0.12	0.1	0.14	0.1	0.1

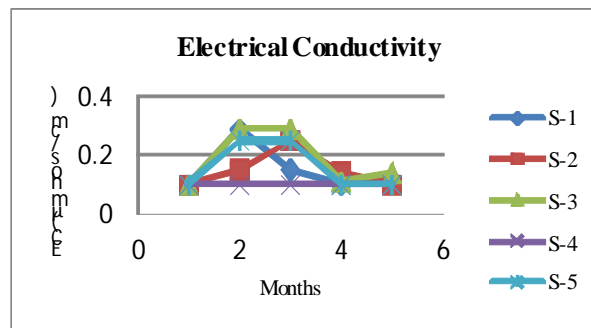


Fig 3.Variation of Electrical Conductivity at 5 Stations

C. ORGANIC CARBON

TABLE 4. ORGANIC CARBON RECORDED AT FIVE STATIONS

MONTH	S-1	S-2	S-3	S-4	S-5
APRIL 5 TH	0.43%	0.21%	0.55%	0.13%	0.45%
MAY 7 TH	0.29%	0.15%	0.39%	0.1%	0.25%
JUNE 6 TH	0.56%	0.49%	0.67%	0.25%	0.25%
JULY 1 ST	0.45%	0.25%	0.45%	0.25%	0.45%
AUG 10 TH	0.45%	0.45%	0.30%	0.25%	0.40%

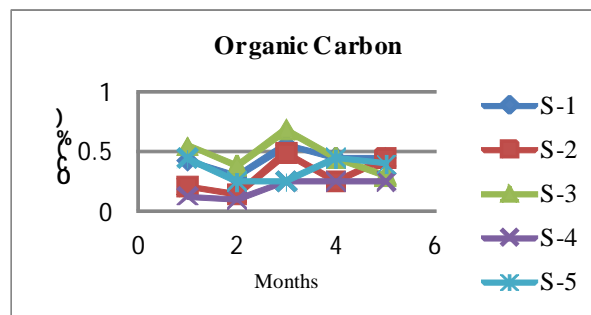


Fig 4.Variation of Organic Carbon at 5 Stations

D. NITROGEN

TABLE 5. NITROGEN AT FIVE STATIONS

MONTH	S-1	S-2	S-3	S-4	S-5
APRIL 5 TH	17.25	14.79	24.96	26.89	28.01
MAY 7 TH	20.47	17.02	23.53	26.23	27.05
JUNE 6 TH	18.21	17.25	20.44	16.05	21.64
JULY 1 ST	22.17	24.87	25.32	23.75	23.88
AUG 10 TH	22.10	24.87	25.22	23.77	23.93

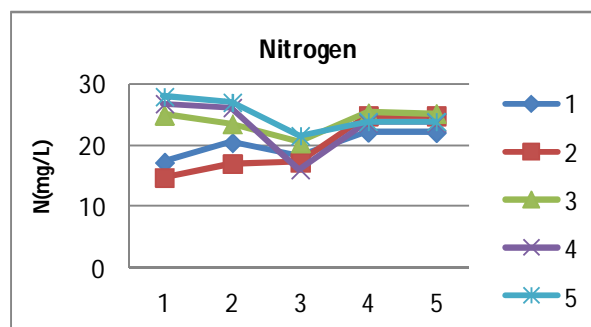


Fig 5. Variation of Nitrogen at 5 Stations

E. PHOSPHOROUS

TABLE 6. PHOSPHOROUS AT FIVE STATIONS

MONTH	S-1	S-2	S-3	S-4	S-5
APRIL 5 TH	0.27	0.84	1.14	0.98	0.58
MAY 7 TH	0.71	1.21	0.93	1.24	0.99
JUNE 6 TH	0.49	0.99	0.92	0.77	1.14
JULY 1 ST	0.50	0.70	1.36	1.17	1.14
AUG 10 TH	0.50	0.70	1.35	1.17	1.12

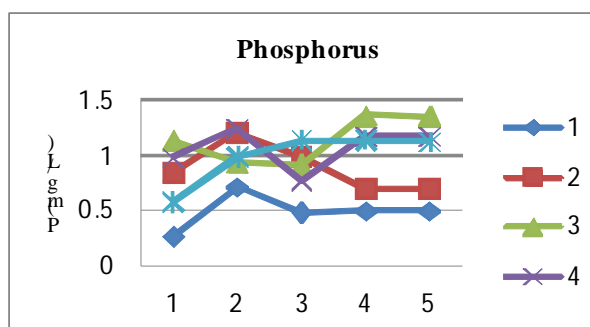


Fig 6. Variation of Phosphorous at 5 Stations

F. POTASSIUM

TABLE 7. POTASSIUM AT FIVE STATIONS

MONTH	S-1	S-2	S-3	S-4	S-5
APRIL 5 TH	16.99	5.70	4.73	9.23	7.66
MAY 7 TH	9.85	7.72	3.99	6.87	7.66
JUNE 6 TH	11.23	6.13	6.86	5.81	7.49
JULY 1 ST	27.44	20.29	21.20	20.73	21.00
AUG 10 TH	27.41	20.28	21.23	20.60	21.01

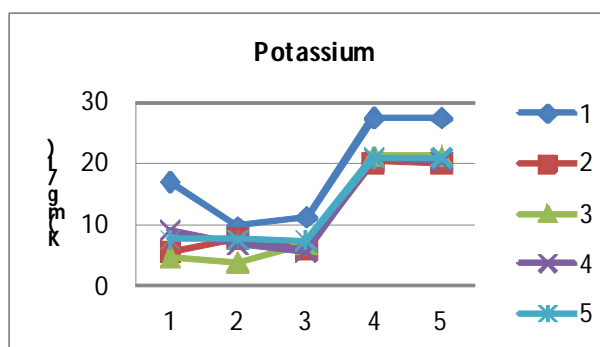


Fig 7. Variation of Potassium at 5 Stations

G. ZINC

TABLE 8. ZINC AT FIVE STATIONS

MONTH	S-1	S-2	S-3	S-4	S-5
APRIL 5 TH	1.48	0.07	8.00	2.70	5.89
MAY 7 TH	1.23	2.50	0.09	5.89	1.50
JUNE 6 TH	1.10	2.40	.06	3.86	2.40
JULY 1 ST	0.23	0.11	0.11	0.54	0.43
AUG 10 TH	0.23	0.11	0.11	0.54	0.43

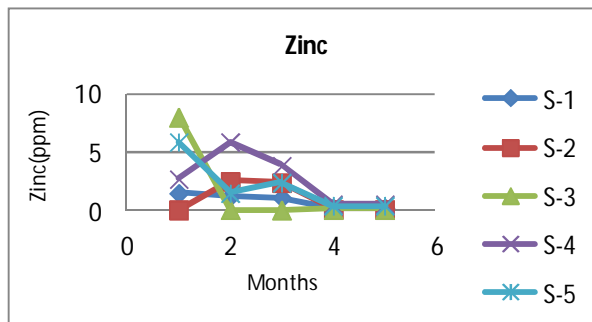


Fig 8. Variation of Zinc at 5 Stations

H. COPPER

TABLE 9. COPPER AT FIVE STATIONS

MONTH	S- 1	S-2	S-3	S-4	S-5
APRIL 5 TH	1.92	2.14	3.22	5.44	7.85
MAY7 TH	2.15	5.33	6.23	2.48	4.02
JUNE 6 TH	1.59	1.95	2.54	5.10	5.50
JULY 1 ST	0.58	0.09	0.11	0.00	0.10
AUG10 TH	0.56	0.00	0.19	0.00	0.10

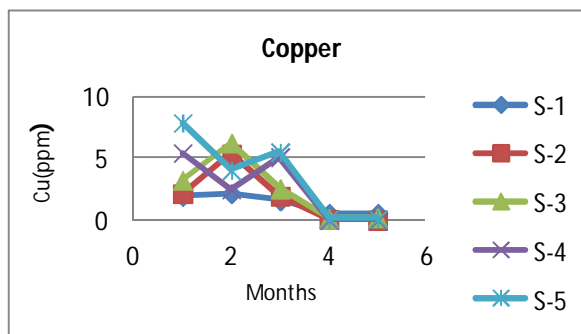


Fig 9. Variation of Copper at 5 Stations

I. MANGANESE

TABLE 10. MANGANESE AT FIVE STATIONS

MONTH	S- 1	S-2	S-3	S-4	S-5
APRIL 5 TH	10.56	22.43	30.61	9.48	15.02
MAY7 TH	9.45	8.24	20.40	29.89	10.00
JUNE 6 TH	17.29	14.99	15.31	13.21	12.63
JULY 1 ST	10.56	22.43	30.61	9.42	13.00
AUG10 TH	16.72	14.30	15.25	13.00	12.85

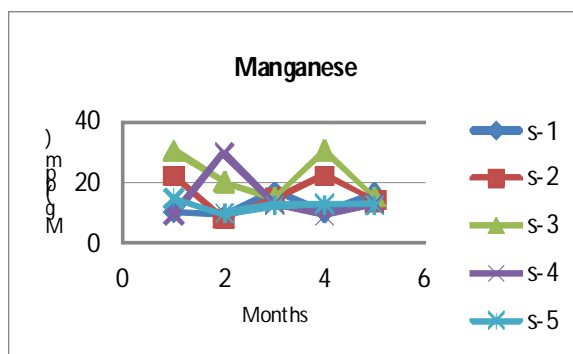


Fig 10. Variation of Manganese at 5 Stations

J. IRON

TABLE 11. IRON AT FIVE STATIONS

MONTH	S- 1	S-2	S-3	S-4	S-5
APRIL 5 TH	15.69	7.57	11.30	11.30	15.46
MAY7 TH	12.50	10.42	6.83	7.45	11.49
JUNE 6 TH	8.67	10.50	9.63	9.63	12.0
JULY 1 ST	16.85	11.42	13.53	12.00	15.15
AUG10 TH	16.40	10.30	13.00	12.50	16.50

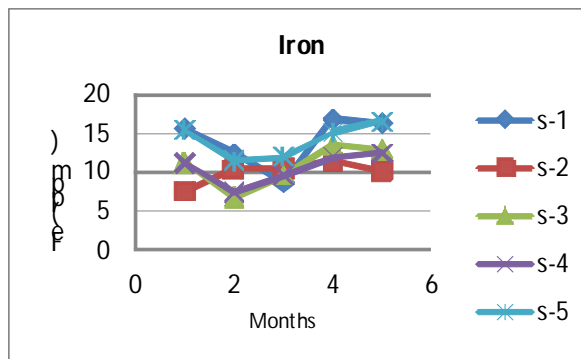


Fig 11. Variation of Iron at 5 Stations

K. PESTICIDE ANALYSIS

Results obtained in pesticide analysis by either LCMS or GCMS based on the stability of Standards:

DIMETHOATE STANDARD LINEARITY CURVE:

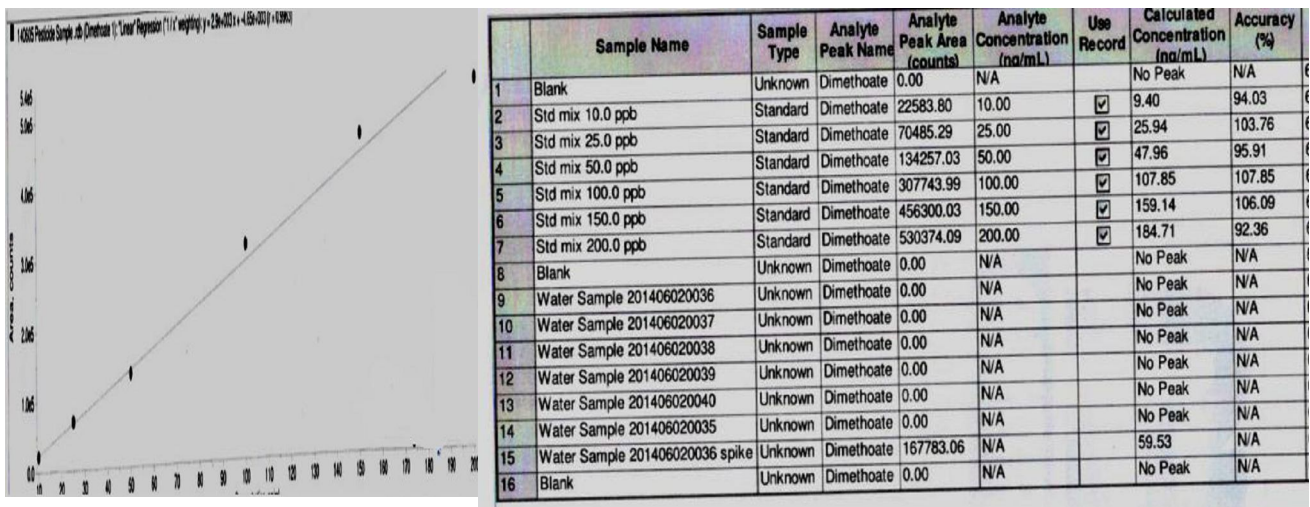


Fig.12 Dimethoate standard Linearity curve

DIMETHOATE CHROMATOGRAM

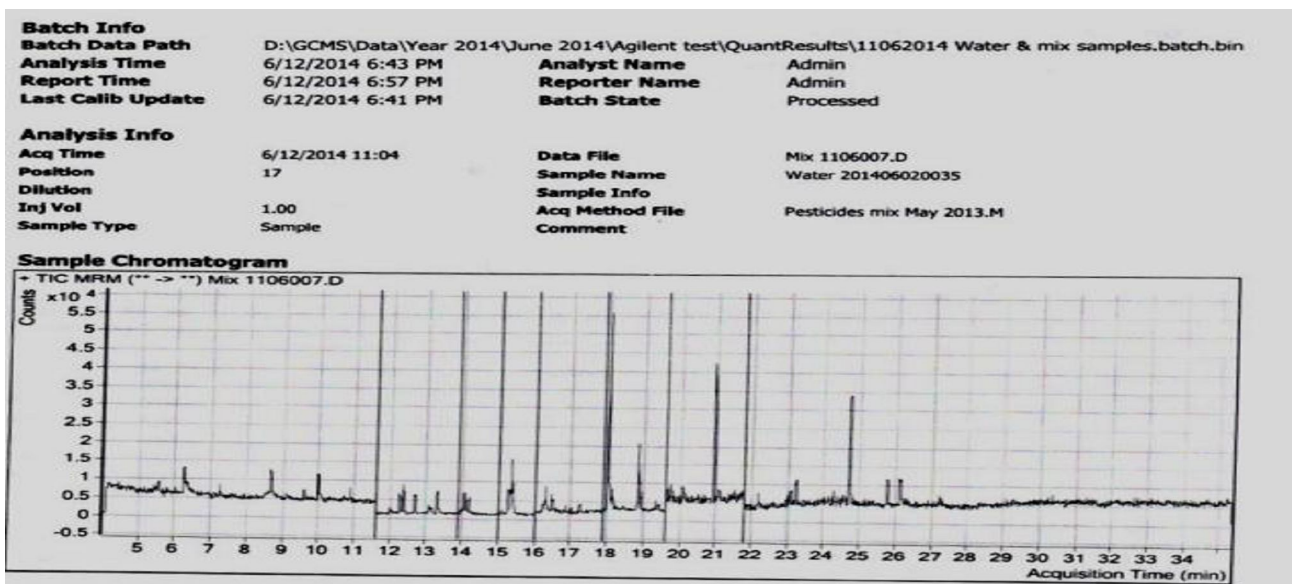


Fig13 Graph of Sample Chromatogram

V. CONCLUSIONS

Various chemical parameters in studied Lake showed distinct, temporal and spatial variations throughout study period.

- ❖ This result shows that the Avaragere Lake receives very high amount of pollution from the surroundings. And the sediment of lake is highly contaminated and if the similar condition continue for the longer period, Avaragere lake may soon become ecological inactive.
- ❖ The Concentration of the Manganese and iron was found to be varying 8.24 ppm to 30.61 ppm and 8.67 ppm to 16.50 ppm. The variation of Manganese and iron in the Sediment throughout the study period was varying because of the fluctuation of Pollutant loads entering into the lake.
- ❖ Organophosphate pesticide residues to be below of standard detection limit.

Linearity curve determined by using different concentrations of the standards helps in quantification of the presence of pesticides in the test samples. The results obtained, reveal that the test samples did not show any presence of pesticides even at a very low concentrations even at nanogram.

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