Journal Homepage: - www.journalijar.com
INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)
Article DOI: 10.21474/IJAR01/2558
DOI URL: http://dx.doi.org/10.21474/IJAR01/2558
ISSN NO. 2320-5407

RESEARCH ARTICLE

STUDIES ON PHYTOPLANKTON DIVERSITY AND WATER QUALITY ASSESSMENT OF A POND WATER IN SIRUKALATHUR PANCHAYAT, KUNDRATHUR TOWN PANCHAYAT, KANCHIPURAM DISTRICT, TAMIL NADU, INDIA.

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Manuscript Info

Manuscript History

Received: 27 October 2016
Final Accepted: 25 November 2016
Published: December 2016

Key words:-
Surface water, Sirukalathur, Pond, Physical-Chemical quality, Biological parameter.

Abstract

A study on the water quality of a pond water in Sirukalathur panchayat, Kundrathur town panchayats, Kanchipuram District To assess the extent of water pollution for the domestic purposes. A pond water in Sirikalathur panchayat is located at 14°16'00"N 70°16'00"E 13°97'00"N 80°37'00"E. The samples of pond water were collected for about Nine Month November 2009 to July 2010. The samples were analysed using standard methods of APHA (1995) and BIS (1991) the results of Physical-Chemical parameters and biological parameters were analyzed. It showed that the samples were highly turbid and the results showed the samples were highly alkaline. Total of 51 species were identified. The characteristic and availability of water had been greatly affected due to population, indiscriminate usage and disposal of water. It is concluded that the Biological and Physical-Chemical parameters were discussed.

Introduction:-

Phytoplankton is the basic food chain component of the aquatic ecosystem. They are distributed in both fresh and marine water ecosystem. They are predominant in fresh water (Ariyadej.C., 2004). A study of Phytoplankton community structure is an indirect assessment of water quality and pollution. Over growth of Phytoplankton lead to algal bloom in aquatic ecosystem, It plays the significant role in degrading the organic matter (Adesalu and Navanko 2008). Phytoplankton is the detectors of environmental changes and other chemicals (Kishore and Joshi 2002). Now-a-days due to sewage and other human activities, the degree of pollution increases, which minimize the number of algal species, but increases the number of individual tolerant species. Pollution brings changes in water quality, modifies the biotic component and elimination of the valuable species. The blue-green algae produce toxins leads to affect the fish growth and some phytoplankton, produce intolerable odor. Many researchers have reported phytoplankton plays the significant role in determining the phyto-algal biodiversity and serves as an index of extent of water pollution. In this study the water quality parameters and biological parameters of Sirukalathur pond water for a period of November 2009 to July 2010 were assessed.

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Materials And Methods:-

The water sample and Phytoplankton samples were collected from the pond water in Sirukalathur panchayat, Kundrathur town panchayat, Kanchipuram District (Map -1) Sirikalathur panchayat is located at 14°16'00"N 70°16'00"E 13°97'00"N 80°37'00"E. The size of the pond is five hundred feet in length, three hundred feet in width and twenty two feet in depth. The samples of pond water were collected for about Nine Month from November 2009 to July 2010 in two litres polythene canes. Plankton net (200 mesh/linear inch) was used for the collection and the samples were mixed with 4% formalin. At the time of collection of water samples the air and water temperature (^{o}C) were recorded. The Physical-Chemical parameters of the samples were analysed using standard methods of APHA (1995) Trivedy and Goel (1986) and BIS (1991) and presented in the tabular and graphical form Venkateswaralu (2006), the phytoplankton were analyzed for the identification under the microscope. The studies were carried out as such as (Fritsch 1935, 1945). Desikatchary (1959), Philipose (1967), Prescott (1969), Iyengarand Desikachary (1981), Krishnamoorthy (2000), Rath and Adhikary (2005).

MAP SHOWING THE LOCATION OF STUDY SITE

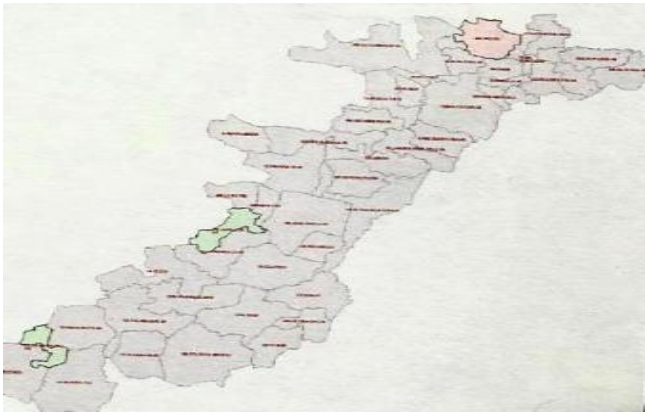

Figure-1:- Kundrathur town panchayat

Figure-2:- Sirukalathur Study Site

Figure-3:- Sirukalathur Pond

Results:-

The present investigation was carried out in a pond at Sirukalathur,Kundrathur town panchayat, Kancheepuram District, Tamil Nadu, India. For a period of nine months from November 2009 to July 2010. The pond water Air temperature ranged between 29^{o}C and 36^{o}C and water temperature ranged from 25^{o}C and 33.5^{o}C. Turbidity and Total dissolved solid levels found from 0.1 to 15.9 NTU, high turbid range was observed in the month of January 10 and low in February 10. Total dissolved solid levels found from 52 to 420 mg/L high range recorded in December-09 and low in November-09. The chemical parameters: pH varied between 5.72 to 7.74 High pH values was recorded in December 09 and dissolved oxygen ranged from 0.9 to 2.6 mg/L. Calcium, Magnesium, was less than the desirable limit. Nitrate, Chloride, Sulphate, Fluoride values were below the desired limit.Iron content recorded

value was very low of .07mg/L and ranged high of 4.87 mg/L in the month of June 10.Silicate content varied between 1.89mg/L and 12.99mg/L. The high value in February 10 and low in November 09.

Physico-Chemical Parameters Of Sirukalathur Pond Water:

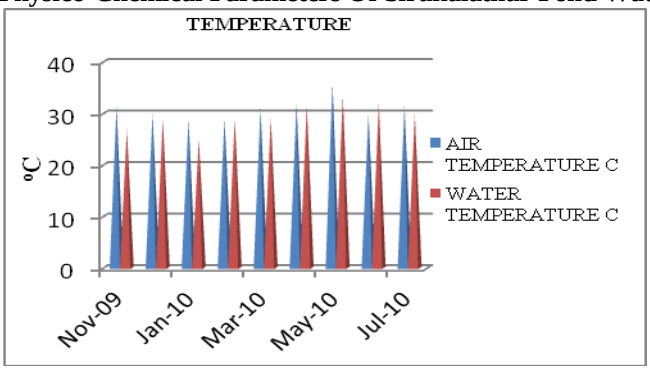

Figure-1, Temperature

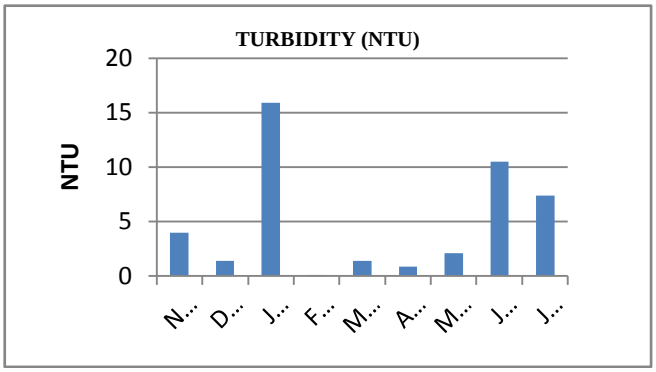

Figure-2, Turbidity (NTU)

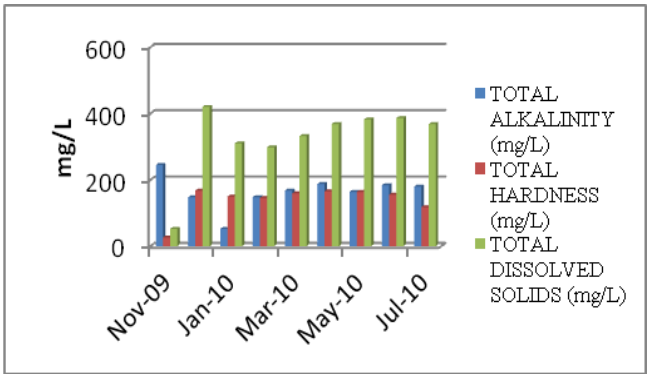

Figure-3:- Total Alkalinity, hardness,

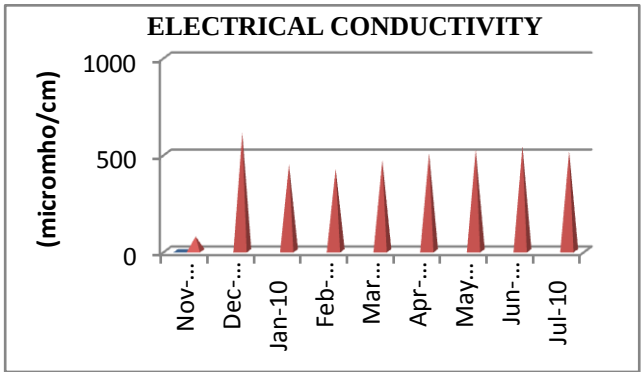

Figure-4:- Electrical Conductivity

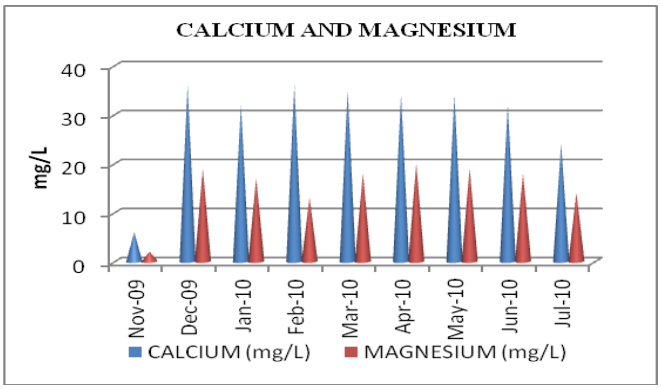

Figure-5, Calcium and Magnesium

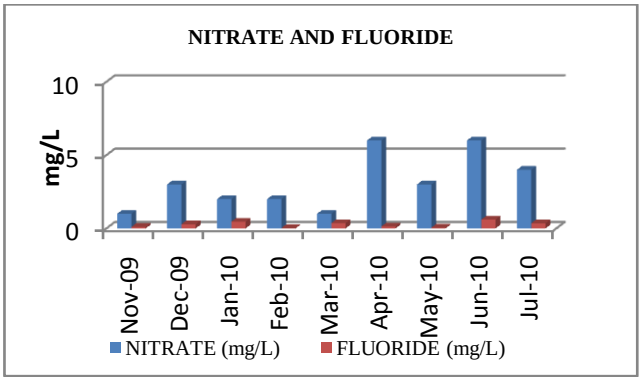

Figure-6, Nitrate and Fluoride

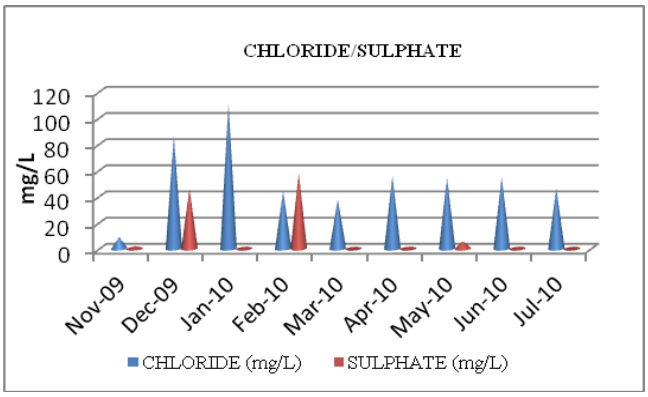

Figure-7:- Chloride and Sulphate

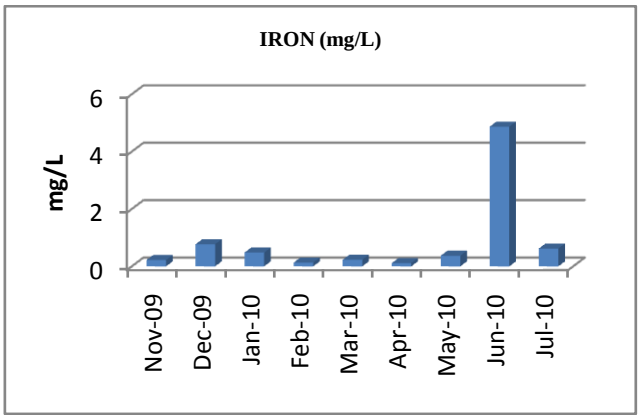

Figure-8:- Iron (mg/L)

Monthly variation of phytoplankton diversity during the period of november 2009 to july 2010:-

The numbers of phytoplankton were identified for every month throughout the study period. There are 54 species investigated in the period of study, the following species vary in each month. There are,

Table: 1

PHYTOPLANKTONS	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10
CYANOPHYCEAE	8	3	4	3	10	3	2	5	2
CHLOROPHYCEAE	8	8	2	4	5			2	2
BACCILLARIOPHYCEAE	3	2		6	3			1	1
EUGLENOPHYCEAE	1			1	1				1
TOTAL	20	13	6	14	19	3	2	8	6

Table: 2

PHYTOPLANKTONS	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10
CLASS-CYANOPHYCEAE	-	-	-	+	-	-	-	-	-
1.Oscillatoria princepsmvaucher (orig)	-	-	-	-	+	-	-	-	-
2.Oscillatoria tenuls (Ag) Ex.Gomt	-	+	+	-	-	-	-	+	+
3.Oscillatoria perronata skuja	+	-	-	-	+	-	-	+	-
4.Oscillatoria cortiyana Meneghiniex Gom	-	-	-	-	+	-	-	+	-
5.Phormidium rettali(Ag) Gom	-	-	+	+	+	-	-	-	-
6.Spirulina giganten Schemidle	-	-	-	+	+	-	-	-	-
7.Lyngybya porphyrosis Fremy	-	-	-	-	+	-	-	-	-
8.Anabaeba orientals Dixit	-	-	-	-	+	+	+	-	-
9.Anabaeba cylinrica Lemm	+	-	-	-	+	-	-	-	-
10..Anabaeba ambigua Rao:C.B.	-	-	-	-	+	+	+	-	-
11. Camphylonemopsis lyegari Desikachary	-	-	-	+	-	-	-	-	-
12.Westllopsis prolifiga janet	-	-	-	-	+	-	-	+	-
13. Gleotrachia ghosei Singh R.N.	-	-	-	-	-	-	-	+	+
14. Spharrozosma wallichi lacobs.	-	-	-	+	-	-	-	-	-

Table: 3

PHYTOPLANKTONS	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10
CLASS-CHLOROPHYCEAE									
15. Pediastrum ovtum(ovate)	+	-	-	-	-	-	-	-	-
16. Scenedesmus bijuga Var, irregular (Wille)	-	-	-	+	+	-	-	-	-
17. Scenedesmus Meyan Varflexious (lemm)	-	-	-	+	-	-	-	-	-
18. Scenedesmus bernadi G.M.	-	-	-	+	+	-	-	-	-
19.Scenedesmus incrassatulus Bohin irregula	-	-	-	-	-	-	-	-	-
20.Scenedesmusoblique (Turp) Kurtz	-	-	-	-	+	-	-	-	-
21.Clostridum siamensis(W.et G.S. Wesr)	-	-	-	-	-	-	-	+	+
22.Clostridum sp.Reinsch	-	-	-	-	+	-	-	-	-
23.Clostridum ehsenbergi Menegh	-	-	-	-	-	-	-	-	-
24. Tetraedron bifidum(Turner)Wille	-	-	-	-	+	-	-	-	-
25. Chlorochitrium limnanthemum(Cunningh)	-	-	-	-	+	-	+	+	+
26. Chroccous turgidus Nag,	+	+	+	+	+	+	+	+	+
27. Ankistrodesmus convolutus(Corda)	+	-	-	-	-	-	-	-	-
28. Ankistrodesmus falcatus (Corda)Ralfs	+	-	-	-	-	-	-	-	-
29.Eremophaera virids (Debray)	+	-	-	-	-	-	-	-	-
30.Spirogyra grantiana Transeau	+	+	-	-	-	-	-	-	-
31.Chalamydomonas carteria Iyengari	+	+	-	-	-	-	-	-	-
32. Cladophora glamerata (L) Kutz	+	+	-	-	-	-	-	-	-
33.Gonatozygon brebissori Debray	-	-	+	-	-	-	-	-	-
34.Gonatozygon Monotarniumi Debray	+	+	-	-	-	-	-	-	-
35. Cosmerium pseudocaronatum,Turner	-	+	-	+	+	-	-	-	-

Table: 4

PHYTOPLANKTONS	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10
CLASS-BACILLARIOPHYCEAE									
36. Mesotaenium sp.,	-	-	-	-	-	-	-	+	+
37.Netrium digitus Her	-	-	-	-	+	-	-	-	-
38.Cymbelia calidrimaum Kurtz	+	-	-	-	-	-	-	-	-
39.Licmophora abreviata Agardh	+	+	-	-	-	-	-	-	-
40.Navicula papula Kurtz	+	+	-	-	-	-	-	-	-
41.Navicula subrhyncocephale	-	-	-	+	+	-	-	-	-
42.Navicula mutica	+	-	-	-	-	-	-	-	-
43. Mastogolia smithi thw	-	-	-	+	-	-	-	-	-
44.Melostria sp(Her) Ralfs	-	-	-	-	+	-	-	-	-
45. Cyclotella combta Var, affins	+	-	-	-	-	-	-	-	-
46.Hypoglossum wood Ward	+	+	-	-	-	-	-	-	-
47. Pinnularia viridis (girdle	+	+	-	-	-	-	-	-	-

view)									
CLASS-BACILLARIOPHYCEAE									
48.Euglena gracilis Klebs	-	-	-	-	-	-	-	-	+
49.Phacus curvicauda Sersenko	+	-	-	-	-	-	-	-	-
50.Euglena proxima	-	-	-	-	-	+	-	-	-
51.Euglena mucifera Maink	-	-	-	+	-	-	-	-	-

Discussion:-

The pond water present the unique fresh water ecosystem. The composition of phytoplankton diversity serves as an important tool to analyze the water quality. Temperature variation of air and water reported in the study ,which agreed with the study of Ariyadej et al., (2004) , Rajagopal et al.,(2010) reported that the temperature plays in the growth of phytoplankton. The turbidity of the pond water was observed high in Jan10(15.9 NTU)-Turbidity is caused due to a side variety level of suspended solids, organic colloid compounds and coarse dispersion of sewage (AkbayNet.al., 1999 ,Kamat 2000)The total dissolved solids in the study ranged between 52mg/L and 420mg/L. BIS(1994) recommends that the fish culture can be done when the total dissolved solid do not exceeds 400mg/L.. The pH value was from 5.72 to 7.74 mg/L This observation agreed with the observation of Bhuiyan and Gupta(2007) WHO(1984) .This report supports that the pond water can be use for drinking purpose. Total alkalinity and total hardness are within the permissible limit. The Calcium and Magnesium was below the desirable limit of BIS (1994).The iron content in the pond water ranged from 0.11 mg/L to 4.87mg/L and the Nitrite level in the water found to be .06 mg/L throughout the study as similarly reported by Ariyadaj et.al., (2005) and Sachindanada moorthy and Yajurvedi (2006).The chloride ,Sulphates and Flouride content was found to be less than the permissible limitof WHO(1984) supporting the pond water can be used for drinking. .Phosphate content observed very less in the water.The low range of phosphate is due to assimilation by phytoplanktons and microorganisms.(Das 2000, Bhuiyan and Gupta 2007) . The content of silica in the water ranged between 5.67mg/L and 12.99mg/L. .The water quality parameters observed in the pond could be used for drinking and fish culture by adding some basic nutrients and suitable disinfectants.

Murugan (2000) reported that the algal species belonging in four classes namely *Cyanophyceae, Chlorophyceae, Bacillariophyceae, Euglenophyceae* during their investigation.similiar observation was present with the total of 51 species.

Chlorophyceae of 21 species observed to be dominant over other three algal classes as similarly reported by Murugan(2008)The pH value play the positive role of the chlorophyceae growth. Chlorocococcoles of 7 species come under chlorophyceae,which is dominant due to high temperature (22-34^{o}C) and low Nitrate content. Malliswar et.al., (2007).The Cyano[hycean were recorded 14 species , less in number compared to chlorophyceae. Rani et.al.,(2004) was reported that low amount of dissolved oxygen reduces the cyanobacterial population. During the month from November 2009 to July 2010.

12 species of Bacillariophyceaes members were less compared with other classes such as chlorophyceae and Cyanophyceae similar report was given by Murugan (2008). The members of Euglenophyceae were recorded very less with four species during the study period.

The species of Oscillatoria, Scenedesmus, Navicula, Pinnularia of the phytoplankton recorded in the most of the months during the study period as similarly reported by Singh.S.P., et .al., (2002) and Garg et.al., (2010)

Conclusion:-

The present study concludes that in spite of the fact that phytoplankton are ubiquitous, their population dynamics are often influenced by the available nutrients and physical-chemical conditions of the ecosystem. Thus, fresh water lentic ecosystem of the pond can be a very good source of water for drinking and domestic use and also generating income from fishery. Hence, it is necessary to protect and conserved these water bodies .This demands immediate action from ecologist, planners, and policymakers.

References:-

1. APHA, (American Public Health Association) 2005. Standard Methods for the Examination of Water and Waste Water. 21st edn, Washington. DC.
2. Adesalu,T.A.and D.L. Nawankaow , 2008, Effect of water quality Index on phytoplankton of a sluggish Tidal Greek in Logos, Nigeria.Pak J.Biol.Sci., 11,836-844.

3. Akbay.N Amul., Yuti.S., 1999, Seasonal distribution of large phytoplankton in keban dam reservoir, plank. Res., 21(4) 771-787.
4. Ariyadej.C., Tanasakul.R., 2005, Physical-Chemical factors controlling phytoplankton in Bang Lang dam reservoir, yala province. The second national conference on algal and plankton. Chiang mai. 575-578.
5. Ariyadej.C., Tanasakul.R., 2004, Phytoplankton diversity and its relationships to the Physico-Chemical environment in the bangang reservoir, yala province .songklamnarcarlin journal of science and technology, 26.595-607.
6. Bhuiyan.A.K., J.Environ.Bio. 2007, Acomparative hydro biological study of a few ponds of barul valley.Assam and their role as sustainable water resources, 28 799-802.
7. Das.A.K, 2000, Phytoplankton primary in some selected reservoirs of Andhra Pradesh.Geo.Bios, 29.37-44.
8. Garg R.K, Rao.R.J. 2010, Seasonal variations in water quality and major threats to Ramsagar reservoir, India Africans, J.Environ.Sci , Vol.4(2) 61-76.
9. Kamat.S and V.Sime, 2005, Hydrobiological studies of two temple ponds . Ecolo.Environ.Cons., 6 361-367.
10. Kishore.K and Joshi.B.D, 2001, 2005, Physico-Chemical characteristics of pond water of Khangpur village in Bareilly district (U.P) 19.89-91.
11. Krishnamoorthy V, 2002, Algae in India and neighboring Countries chlorophyata oxford I B M pbl, 203.
12. Malliswari.V.D.S. Krupanidhi 2007, Algal biodiversity in a man -made water body. Indian Hydrology, 10(1) 87-97.
13. Murugan,C.B. and Dhande R.R, 2000, Algal biodiversity with respect to pollution status of wadali lake, amaravathi(M.P) India. J.A.Biol.Vol. 15(1) 1-5.
14. Rajagopal.T, Thangamani.A l, 2010, Comparison of Physico-Chemical parameters and phytoplankton species diversity of two perennial ponds in Sattur area Tamil Nadu. J. Environ.Biology, 31(5) 787-794.
15. Rani.R, Gupta.B.K., and Srivastava.K.B., 2004, Studies on water quality assessment in Patna city (M.P) sessonal parametric variations Nat.Env.Tech., 3(4) 563-565.
16. Sachinandamurthy.K.L. and H.N Yajurvedi, 2006, A study on Physico-Chemical parameters of an aquatic body in Mysore city., Karnataka.,In.J.Env.Biol. 27.615-618.
17. Singh.S.P. Pathak D. and Singh J.R, 2002, Hydrolobiological studies of two ponds of Satha (M.P) In.Eco.Env.Conser, 8.289-292.