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Water Quality Assessment of Temple Pond in Kallepalli, Srikakulam, Andhrapradesh, India.

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Abstract*: The present study consist the physicochemical features examined on the Kallepalli temple pondnear Srikakulam,Andhra Pradesh, India, on the monthly basis for two years (May 2014 to April 2016). Water samples were analyzed by following APHA standard methods, for Physicochemical Parameters like air and water temperatures, transparency, EC, TSS, TDS, pH, DO, BOD, COD, total alkalinity, total hardness, chloride, calcium, magnesium, potassium, sodium, nitrates and phosphates for two years May 2014 to April 2016. The investigation report of the Sri Mani Nageswara temple pond revealed that the average values of 24.7^{o}C, 24.35^{o}C, 26.85cm, 513.5µs/cm, 35.5mg/l, 295mg/l, 7.45, 6.5mg/l, 2.86mg/l, 20.75mg/l, 128.5mg/l, 87.5mg/l, 66mg/l, 40.4mg/l, 23.45mg/l, 2.54mg/l, 8.91mg/l, 0.53mg/l and 0.44mg/l respectively. Inter relationship between physicochemical parameters (Pearson's Correlation matrix) was also recorded. In this observation temperature showed strong positive correlation with EC (r=0.89) and TDS (r=080) and negative correlation with DO (r=-0.97). EC and TDS showed positive correlation with nitrates (r=0.81) and (r=0.73) respectively. TSS showed positive correlation with phosphates (r=0.66) and pH showed positive correlation with total alkalinity (r=0.86) and calcium (r=0.91). This study could help the water quality monitoring and regulation in order to improve the quality of water with better sustainable management of Sri Mani Nageswara Temple Pond,Kallepalli.*

Key words*: Physicochemical Parameters, Pearson's Correlations Matrix, Sri Mani NagewaraTemple Pond - Kallepalli, Srikakulam District, A.P.*

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I. Introduction

Water is most specious factor for living organisms. Quality of water in ponds and rivers may vary subject on geological morphology. Due to the growing population and increasing human activities, the sewage and municipal wastage are responsible for pollution of lentic and lotic water bodies. One of the religious purposes of water is its use in sacred rituals performed at temple premises. The neglected temple tanks are enriched with nutrients by surface runoff, temple effluents, holy dips, cleaning of cloths, limbs,and utensils, lighting of lamps and spreading of holy powders (Sulbha and Prakasam, 2006).The maintenance of healthy temple pond water is dependent on the physicochemical features. There is proper monitoring of temple ponds with necessary parameters with reference to the water quality. It may prevent the further deterioration of pond water (Jalal and Sanalkumar, 2013).

The present study was conducted on impact of seasonal changes in physicochemical properties of Sri Mani Nageswara Temple Pond. The results were compared with surface water quality standards given by Bureau of IndianStands.

II. Materials And Methods

Study area: Sri Mani Nageswara Temple pond, Kalepalli, Srikakulam A.P. India is located at latitudes 18.37^{o}N and with longitude 83.92^{o}E. Surface area of the water in the pond during rainy season is around 1.5 hector and depth is 5 meters. Water spread area in summer is around 0.50 hector with 1 meter in depth. It is a village temple pond. Most of the villagers visit this temple on Mondays and every day in the month of Kartheekam (Telugu year). The temple effluents are mixing with water every day and on the other hand villagers troughed the garbage into the pond. The congregations of pilgrims to celebrate holydays often have a severe impact on the pond water's physicochemical and biological characters.

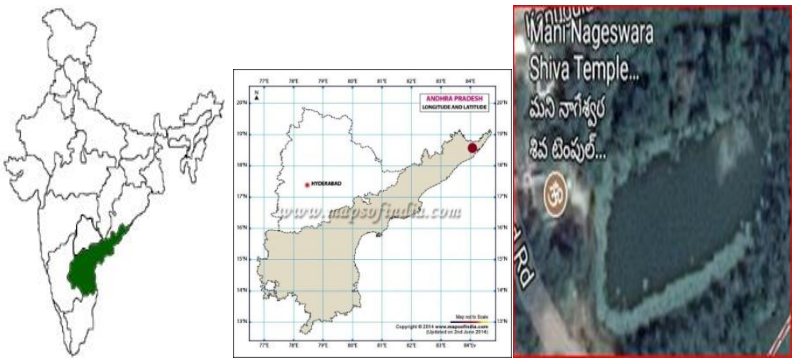


Fig.1. Map and Location of Sri Mani Nageswara Temple Pond, Kallepalli, A.P., India

Sampling:The study site was visited every month during the period from May 2014 to April 2016 for collection of samples. The water sample were collected from five points of the pond with help of a bucket and filled in 2 liter sample bottles and then transported to the laboratory. The procedure for collection, storage and analysis of water samples were followed as described in standard methods (APHA, 1998). At spot, air and water temperatures were measured with a centigrade gloss mercury thermometer with the range of O^oC to 110^oC calibrated to tens, transparency (Secchi Depth) was measured by Sacchi Disc and the pH of the water was determined by digital pH meter(Model HANNA instrument). Total suspended solids were as per Ambasht (1990) and the others such as electrical conductivity, total dissolved solids, DO (Winkler's method), total alkalinity,total hardness(EDTA titration method), calcium, magnesium, sodium, potassium, chlorides, nitrates, phosphates, COD, BOD were determined at laboratory as per APHA 1998.

III. Results and Discussion

Data was collected on the physicochemical parameters of the study site, Sri Mani Nageswara temple pond, Kallepalli during May 2014 to April 2016 was presented in Fig. 1&2.

Temperature is one of the significant physical factor which influencing the abiotic and biotic components of the aquatic environment. It is a driving variable for distribution and growth of the phytoplankton (Barupal and Gehlot, 2016).In the present investigation, maximum air and water temperatures (34.7^oC and 29.3^oC) was observed in the month of May 2015 and minimum air and water temperature (20.1^oc and 19.4^oC) was recorded in January 2015 (Fig. 2) as reported by the earlier observations of Sharma et al. (2011), Javiad and Ashok (2012) Jyotsna et al.(2016).Air temperature showed more seasonal fluctuations than the water temperature due to the seasonal effect of summer and winter. In the correlation studies air and water temperature showed strong positive correlation with electrical conductivity (r=0.91) and (r=0.87), total dissolved solids (r=0.81) and (=0.78), pH (r=0.72) and (r=0.68), BOD (r=0.89) and (r=0.87), COD (r=0.88) and (r=0.84), Phosphates (r=0.84) and (r=0.87), Nitrates (r= 0.82) and (r=0.75), calcium (r= 0.76) and (r=0.71) and negative correlation with dissolved oxygen (r=-0.97).A good synchronization between temperature and dissolved oxygen, i.e. a significant inverse relationship was observed (Aba Mustapha 2013).

In the present study average depth of transparency was 26.85cm with maximum of 35.9 cm in the month of April 2016 while minimum of 17.8cm was observed in the month of August 2015 (Fig. 2). Similar observations were made by Dhanalaxmi(2013) and Anjali Bhayal et al.(2016). These varying trends showed that during summer high light penetration and monsoon season water was turbid due to surrounding areas inflow. Transparency showed positive correlation with total hardness (r=0.82), Chlorides (r=0.90) and total alkalinity (r=0.63).

Electrical Conductivity is found to be good indicator of the overall water quality. In Sri Mani Nageswara temple pond electrical conductivity values(635µs /cm) were observed in the month of May 2015,while minimum values(392µs /cm.) were recorded in the month of December 2014 (Fig. 2).As per SWQS (IS 2296: 1992) EC is 1000-2250µs /cm). The results were correlated with the findings of Sharma et al. (2011),Sayeswara et al. (2011) andKarthikyan at al. (2018). Electrical Conductivity showed significant positive correlation with TDS (r=0.89), Sodium (r=0.70) and Nitrates(r=0.81) and negative correlation with DO (r=-0.84). Similar observations were made by Jyotsna et al. (2016).

The total suspended solids are considered to represent the indirect measure of turbidity of the water. Total suspended solids (67mg/l)were observed in July 2014 and (4mg/l)lower value observed in November 2015 (Fig. 2). Similar results were recorded in rainy season by Dhanalakshi et al. (2013).TSS showed positive correlation with Phosphates (r=0.66).

The maximum Total Dissolved Solids found in Sri Mani Nageswara temple pond were 379mg/lin May 2015 while minimum 217mg/l were in December 2014.Similar findings were made by Rajnarayan (2007) and JaklinJemi (2011). The highest TDS might be due to surface runoff, temple disposals and accumulation of the

anthropogenic activity to waste disposals around the temple pond (Senthlkumar and Sivakumar(2008), Ajayan et al. (2013)and Vidhya Lakshmi and Avinash(2014). TDS showed positive correlation with water temperature (r=0.78), EC (r=0.89), pH (r=0.72) and nitrates (r=0.73) and negative correlation with DO (r=-0.78). Similar observations were recorded by Jyotsna et al. (2016).

In the present investigation, the higher hydrogen ion concentration (8.5) was recorded in May 2014 and lower pH (6.4) was observed in the month of September 2014 (Fig. 3).As per Surface Water Quality Standard (IS 2296: 1992) pH is 6.5 -9. Similar findings were made byElayaraj and Selvaraju (2014). The pH values were fluctuated from monsoon to summer due to higher rate of inflow in the monsoon season and higher rate of evaporation and less inflow in the summer season (Sharma et al. 2011). The pH showed strong positive correlation with temperature (r=0.72), total alkalinity (r=0.86), total hardness (r=0.84), calcium(r=0.91) and potassium (r=0.80).Similar correlation reports were recorded by Tidame and Shinde (2012).

Maximum Dissolved Oxygen value 7.9mg/l was recorded in the month of February 2016 and minimum value 5.1mg/l was observed in the month of May 2015(Fig. 3).According to the observations, DO levels were medium range in the pond with an average of 6.5mg/l. As per SWQS (IS2296; 1992) DO is 4-6mg/lsuitable for good water. Similarfindings were observed by Jyothi et al. (2013). Dissolved Oxygen showed a significant negative correlation with temperature (r=-0.97), EC (r=-0.84), total alkalinity (r=-0.56), BOD and COD(r=-0.93) phosphates (r=- 83) and nitrates(r=-0.79) (Sharma et al. 2011 andAjayan et al. (2013).

The higher values of BOD and COD indicate the pollution by biodegradable substances in the water. This condition attributed to anthropogenic interference in and around the pond area (Ravichandran et al. 2009). Biological Oxygen Demand value of 4.48mg/l was high in the month of April 2016 while low value of 1.24mg/l was recorded in the month of January 2016 (Fig. 3). Similar results were observed by Dhanalakshmi et al.(2013) and Ajayan et al. (2013) in their studies.According to Hynes (2009) the BOD range in between 2-7 mg/l represents the pond water was slightly polluted. Further as per the water quality standards for human use as CPCB, this temple pond water is not suitable for bathing (Devi et al 2013). BOD was showed positive correlation with Temperature (r=0.89), calcium (r=0.80) and total alkalinity (r=0.63).This correlated with the work of Ajayan et al. 2013).Higher chemical Oxygen Demand value 17.51mg/l was observed in the month of May 2014 and lower value 3.24mg/l was recorded in the month of October 2014 (Fig. 3). COD showed positive correlation with total hardness (r=0.73) Calcium (r=0.90) and phosphates(r=0.76).

Total alkalinity of the study pond ranged from 85mg/l in December 2014 to 172mg/l in May 2015(Fig. 3). In the present investigation alkalinity more in summer season and less in post rainy months. Similar observations made by Ajayan et al. (2013) in Ananthapura Temple Lake of Kasaragod, Kerala and Tidame and Shinde (2012). Total alkalinity showed strong positive correlation with Total hardness (r=0.87) and chlorides (r=0.82).

Higher value of total hardness value of 120mg/l was observed in the months of April 2014 and May 2015while lower value of 55mg/l was recorded in the months of January and November 2016 (Fig. 3). As per SWQS (IS 2296:1992) hardness is 300 mg/l. The increase in hardness can be attributed to the lower levels of water volume due to high rates of evaporation. Similar observations were recorded by Kaur and Sharma (2001), and Karthikyan et al. (2018). Total Hardness showed positive correlation with Chlorides (r=0.95) and Calcium (r=0.72).

Chloride is one of the major anion found in water, associated with calcium, magnesium and sodium. Higher chloride contents indicate the high rate of anthropogenic activities in the pond. The maximum Chloride content value of 94mg/l was observed in the month of May 2015 and minimum value of 38mg/l was recorded in December 2014. It may be due to dilution effect of post monsoon season (Fig. 3), The results were found within the permissible limits for drinking water (600mg/l) and irrigation (500mg/l) prescribed by IS: 10500 and BSI, FAO and SWQS (IS 2296: 1992) 250-600mg/l. Similar results were noticed by Ajayan et al. 2013. These medium ranges of chlorides showed the limited rate of human interference in the temple pond. Chlorides showed positive correlation with TA (r=0.82), TH (r=0.95), potassium (r= 0.92), Magnesium (r=0.87) and sodium (r= 0.81) and negative correlation with TSS (r=-0.71).

Highest amount of calcium and sodium was found in the ponds in summer season due to detergents added by human bathing, washings and domestic wastes reached into the pond water (Prathap and Regini, 2011). Higher values of calcium, magnesium and potassium were recorded (50.4mg/l, 29.6mg/l and 3.8mg/l) in the month of May 2015 and lower values (30.4mg/l and 17.3mg/l in September 2014 and 1.27mg/l in July 2014 respectively) were recorded (Fig.3). Similarobservations were made by Ashish (2006), Tidame and Shinde (2012), Agbair (2015), Barupal (2016), Elayaraj et al. (2016) and JayaramNaik (2017). Calcium showed positive correlation with pH (r=0.91), Sodium (r=0.82) and Nitrates (r=0.70). Magnesium showed positive correlation with TH (r=0.88), chloride (r=0.87), Potassium (r=0.82) and Sodium(r=0.68). Potassium showed positive correlation with pH (r=0.80), TA (r=0.86), TH (r=0.96), and Sodium (r=0.87). Maximum value of sodium (15.67mg/l) was recorded in the month of May 2014 and minimum value (2.15mg/l) in October 2014 was noted

(Fig. 3). Similar findings were recorded by Rajnarayan et al. (2007). Sodium showed positive correlation with EC (r=0.70), TDS (r=0.77), pH (r=0.84), TA (r=80), TH (r=0.83) and chloride (r=0.81).

The main source of nitrate is decomposition of organic matters. In Sri ManiNageswara temple pond maximum nitrate values of 0.78mg/l was recorded in May 2015 while minimum values of 0.28mg/l was noted in December 2014 (Fig. 3).As per SWQS (IS 229:19926) nitrate is 20-50mg/l. Similar findings were recorded by PriyankaYadav et al. (2013) and Jyothi and Narsimharao (2013). Nitrates showed positive correlation with temperature (r=0.75), EC (r=0.81) TDS (r=0.73), COD (r=0.83) and calcium (r=0.70) and negative correlation with DO (r=-0.79).

Maximum phosphate (0.77mg/l) was recorded in the month of July 2014 and minimum (0.11mg/l) was observed in January 2016(Fig. 3). During rainy season, the increases are in phosphate concentrations due to decay of phytoplankton and concentrations of zooplankton excreta (Abdar 2013).Similar investigation reports were recorded by Ansri et al. (2012) and Krishnamoorthi and Selvakumar (2012). The phosphate concentration above 0.5 mg/l indicates pollution (Jain et al. 1996). Phosphates showed positive correlation with temperature (r=0.84), TSS (r=0.66), COD(r=0.73), BOD (r=0.76) and calcium(r=0.64) and negative correlation with DO (r=-0.84) as observed by Anjali Bhayal et al. (2016).

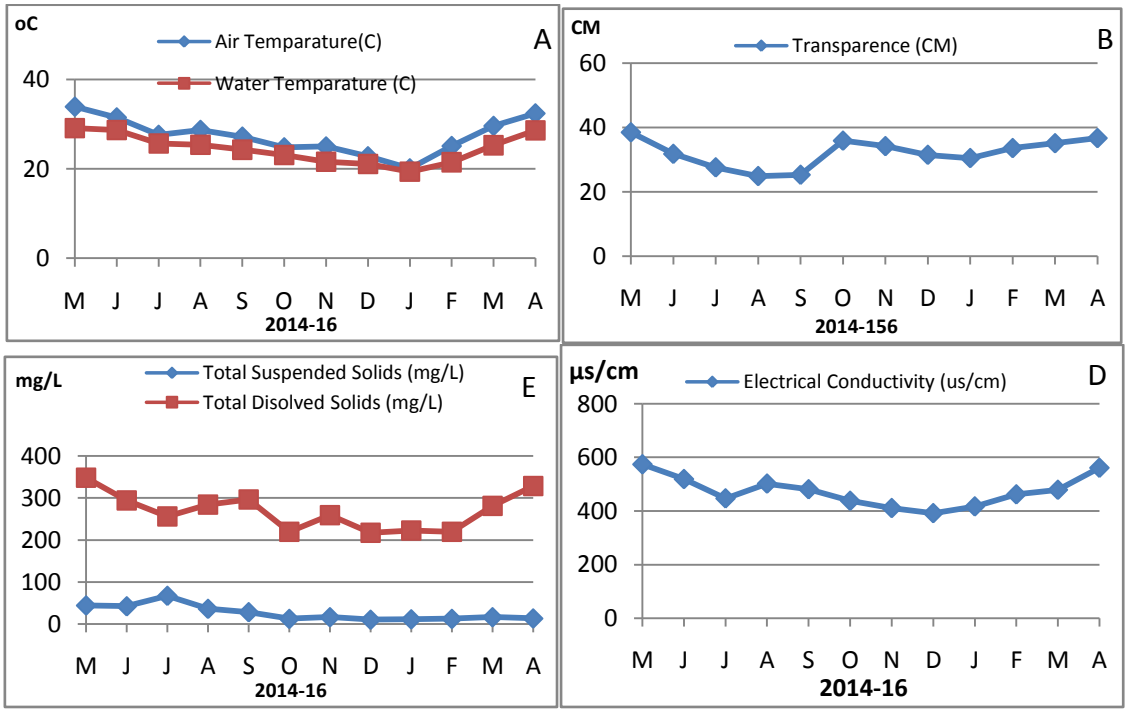
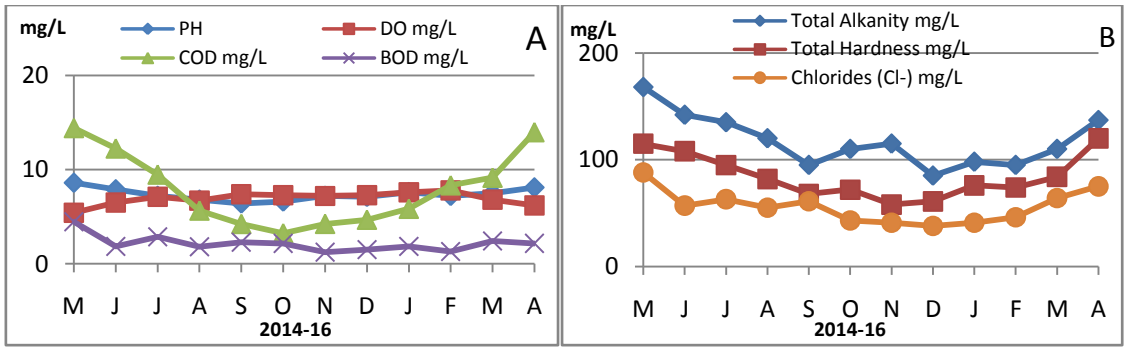


Fig. 2.Seasonal Changes in Physical Parameters at Sri Mani Nagewar Temple Pond, Kallepalli, Srikakulam, A.P. India.



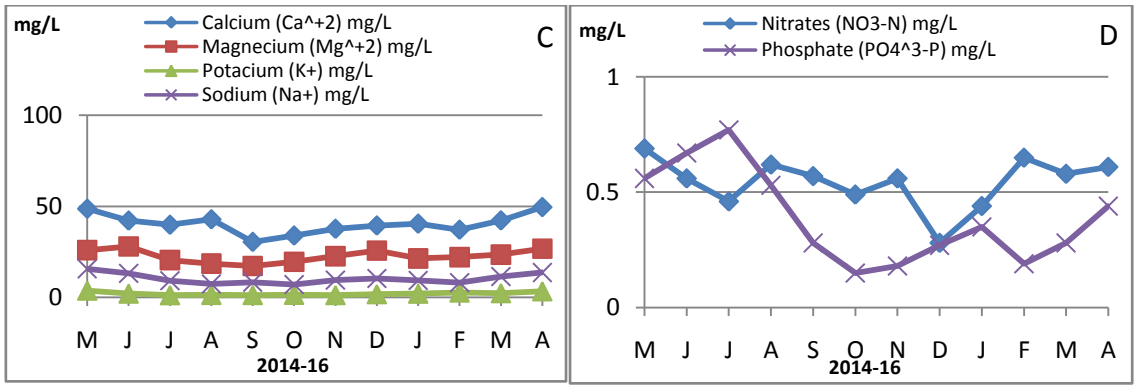


Fig.3. Seasonal Changes in Chemical Parameters at Sri Mani Nageswara Temple Pond, Kallepalli, Srikakulam, A.P. India.

Fig.4 Correlation matrix among physicochemical variables of Sri Mani Nageswara Temple pond during May 2014 to April 2016.

Name of the Parameter	AT	WT	TRA	EC	TSS	TDS	pH	DO	COD	BOD	TA	TH	Cl	Ca	Mg	K	Na	NO3	PO4
AT	1																		
WT	0.99	1																	
TRA	-0.01	-0.1	1																
EC	0.91	0.87	0.19	1															
TSS	0.2	0.27	-0.88	-0.09	1														
TDS	0.81	0.78	0.44	0.89	-0.3	1													
pH	0.72	0.68	0.48	0.61	-0.17	0.72	1												
DO	-0.97	-0.97	0	-0.84	-0.26	-0.78	-0.77	1											
COD	0.88	0.84	0.26	0.78	0.04	0.79	0.84	-0.93	1										
BOD	0.89	0.87	0.19	0.77	0.12	0.77	0.81	-0.93	0.91	1									
TA	0.46	0.39	0.63	0.42	-0.3	0.56	0.86	-0.56	0.79	0.63	1								
TH	0.5	0.43	0.82	0.56	-0.6	0.78	0.84	-0.53	0.73	0.63	0.87	1							
Cl	0.33	0.26	0.9	0.45	-0.71	0.62	0.76	-0.36	0.58	0.47	0.82	0.95	1						
Ca	0.76	0.71	0.33	0.68	0.02	0.67	0.91	-0.81	0.9	0.8	0.87	0.72	0.62	1					
Mg	0.38	0.37	0.74	0.44	-0.59	0.71	0.76	-0.4	0.54	0.47	0.69	0.88	0.87	0.58	1				
K	0.45	0.38	0.79	0.5	-0.6	0.72	0.8	-0.49	0.68	0.56	0.86	0.96	0.92	0.69	0.82	1			
Na	0.65	0.59	0.61	0.7	-0.34	0.77	0.84	-0.69	0.76	0.72	0.8	0.83	0.81	0.82	0.68	0.87	1		
NO3	0.82	0.75	0.18	0.81	0	0.73	0.64	-0.79	0.83	0.72	0.55	0.57	0.42	0.7	0.26	0.52	0.65	1	
PO4	0.84	0.87	-0.41	0.61	0.66	0.48	0.5	-0.87	0.73	0.76	0.28	0.13	-0.07	0.64	0.09	0.07	0.32	0.55	1

Note: AT-Air Temparature(C), WT-Water Temperature (C), TRA-Transparency (cm), EC- Electrical Conductivity (µs/cm), TSS-Total Suspended Solids (mg/l), TDS-Total Dissolved Solids (mg/l), pH, DO (mg/l), COD (mg/l), BOD (mg/l), TA- Total Alkalinity (mg/l), TH- Total Hardness (mg/l), Cl- Chloride (mg/l), Ca- Calcium (mg/l), Mg - Magnesium (mg/l), K- Potassium (mg/l), Na - Sodium (mg/l), NO3-Nitrate (mg/l) and PO4 -Phosphate (mg/l).

IV. Conclusion

The present study revealed that the Sri Mani Nageswara Temple Pond water status ranges from clean to slightly pollute as per SWQS (IS 229:19926). If the unwanted human activities are continued in the pond, it is later on turn to breeding grounds of mosquitoes and other pathogenic organisms. It is likely that in near future the pond would turn to mesotrophic status. Stringent measures can be taken to prevent the anthropogenicand other animals from polluting the pond. Proper sanitation measures and environmental awareness programs to public care and temple authorities are essential to keep the water body clean and safe. This pond supports to develop a walk- path, growing of sacred plants and beautiful land scalping for enhancing the beauty of the village and attract a lot of nature- lovers.

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References

[1]. Aba Mustapha, BelghytiDriss, Benabid Mohamed Seasonal Variations in Physicochemical Parameters of water Body Amghass II Province IfraneMorocco. *Univ. J. of Environ. Res.Tech*. Vol.3 Issue6: 2013 pp.660-666.

[2]. Abdar M.R. (2013): Physicochemical Charecteristics and phytoplankton of Morna Lake, Shiral (M.S.) India. *Biolife.*1(2):2013 pp.1-7.

[3]. Agbaire, Patience Odafevejiri, Akporido, Samuel Omorovie and EmoyanOnoriodeOnos, (2015): Determination of some physicochemical parameters of water from artificial concrete fish ponds in Abraka and its environs, Delta State, Nigiria. *Int. J. of Plant, Anim. and Environ. Sci.* Vol. 5, Issue 3, 2015 Pp. 70-76.

[4]. Ajayan K.V., Selvaraju M. and Thirugnanamoorthy K. Phytoplankton Population of Ananthapura Temple Lake of Kasaragod, Kerala. *Insight Botany* 3 (1), 2013 pp.6-14.

[5]. Ambasht A.K. Environment Impact of nutrient Discharges by aquaculture Waste Water on the haraz River. *J. Fish Aquat Sci*. 3: 2008 pp.275-279.

[6]. Anjali Bhayal, Kanhere R.R. and Hemantpandit.Physicochemical analysis of Sajvay pond in fresh water area of Barwani district, MP, India.*Int.J.ofCur. In. Res.*, vol.2,Issue 12, 2016 pp. 529-531.

[7]. Ansari Ekhalak, GadhiaMohini and SuranaRajaja.Water quality of temple pond (Khajod) of Surat District, India.*Proceeedings of Int. Conf. SWRDM* 2012, pp. 27-30.
[8]. APHA. Standard Methods for examination of water and waste water.20thEdn.APHA, AWWA, WEF, Washington DC, USA, (1998).
[9]. AsheshTiwari and Chauhan S.V.S. (2006): Seasonal Phytoplankton diversity of Kitham Lake, *Agra.J. of Environ. Bio*.27(10), 2006 pp.35-38.
[10]. BarupalG.K. and gehlot R.K.,Limnological profile of Kolayat Lake, Bikaner with special reference to seasonal fluctuation and correlative interaction.*J. Algal Biomass Utln.,* 7 (2):2016 pp.176-183.
[11]. BIS, *"Indianstandards for surface water. Bureau of Indian Standards*", New Delhi, IS 2296, 1992.
[12]. CPCB., Guidelines for water quality monitoring, Central Pollution Control Board, ParineshBhavan East Arjun Nagar, Delhi – 39 (2007).
[13]. Dhanalakshmi V., Shanthi K. and Remia K.M. Physicochemical study of Eutrophic in Pollachi town, Tamilnadu, India. *Int. J. of Cur.Microbiol.and App. Sci.* Vol. 2 No. 12, 2013 Pp. 219-227.
[14]. Devi M.Banita,DasTapati and Gupta SusmitaLimnological studies of Temple Ponds in Coachar District, Assam, North East India.*Int. Res. J. of Env. Sci.* Vol.2(10), 2013 pp.49-57.
[15]. ElayarajB. and SelvarajM. Water quality variations and screening of microalgal distribution in Thachanpond ,ShidambaramTaluk of Tamilnadu. Int. J. of Biol. Res. 2 (2) 2014 pp.90-95.
[16]. Elaraj B., Selvaraju M. and Ajayan K. V. Assay on water quality variations of Pasupatheswarar Temple pond, Annamalai Nagar, Tamilnadu, India. *J. of Inter. Academic Res. for Multi-Dis.* Vol.3 Issue12: 2016 pp. 97-108.
[17]. Hynes H.B.N., The biology of Polluted Waters, Liverpool University Press, Liverpool, 1960 pp.555.
[18]. JacklinJemi R. and ReginiBalasingh G.S. Studies on Physicochemical Characteristics of Freshwater Temple Ponds in Kanyakumari District (South Tamilnadu), *Int. J. of Geo. Earth and Env. Sci*., 1(1): 2011 pp.153-158.
[19]. Jalal, N., Firozia and Sanal Kumar, M.G. Water quality Assessment of Pamba River of Kerala, India in relation to Pilgrimage Season. *Int.J.Res.Chem. Envir.*, 3(1): 2013 pp.341-347.
[20]. JayaramNaik V.M.,Ramanaiah Philip G.H.Assement of water quality (physicochemical) of Kanekal tank, Anantapuramu, Andhra Pradesh, India. *J. of Experimental Sci.* 8: 2017pp. 8-15.
[21]. Javad Ahmad Shah and Ashok K. Pandit.Physicochemical Characteristics of water in Wular Lake, -A Ramsar Site in Kashmir Himalaya.*Int J. of Geo. Earth and Environ. Sci.* Vol. 2 (2) may- August, 2012 pp.257-265.
[22]. Jyothi K and NarasimhaRao G.M. Diversity and seasonal variation of phytoplankton in physicochemical parameters in Thatipudi Reservoir, Visakhapatnam, Andhra Pradesh, India. *Seaweed Res. Utiln.* 35 (1&2): 2013 pp.211-219.
[23]. Jyotsna N., SubbaRangaiah G. and Mohan NarasimhaRao G. A study on Seasonal changes of microalgae in relation to the physicochemical parameters of Satyavaram Pond, Srikakulam Dist. India. *Indian J.* of *Geo. Marine Sci.* Vol. 45 (12): 2016 pp.16660-1668.
[24]. Karthikyan D.,Kumaresan S. and Balakumar B. S. Seasonal Diversity of Scenedesmus Sp. in a Temple Tank: A case study from Chennai, Tamilnadu, India. Eco Chronicle, Vol. 13 (3): 2018 pp.169-179.
[25]. KrishnamoorthiA. and Selvakumar S. Seasonal fluctuation of Zooplankton community in relation to certain physicochemical parameters of Veeranam Lake in Cuddalore district , Tamilnadu. *Int. J. of res. in Environ. Sci. and Tech.* 2(2): 2012 pp.22-26.
[26]. Kaur H. and Sharma I.D. Hydrobiological studies on river Basantar, Samba, Jammu (Jammu and Kashmir). *J. Aqua. Biol*.16: 2001 pp.14-44.
[27]. Prathap Singh R andReginiBalasinghG.S., Limnological studies of Kodaikanal Lake (Dindugal District), In special reference to Phytoplankton Diversity. *Indian J. Fundmtal.and Appl. Life Sci.* , Vol. 1(3), 2011 pp. 112-118.
[28]. PriyankaYadav, Yadav V.K., Yadav A.K. and Khare P.K. Physicochemical Characteristics of a fresh water pond of Orai, U.P., Central India.*Octa. J. Biosci.*Vol.1(2): 2013 pp.177-184.
[29]. Raj Narayan, SaxenaK.K. and ShaliniChauhan. Limnological investigations of Taxi Temple Pond in district Etawah (U.P.).*J. of Envl. Biol.* Vol. 28 (1), 2007 pp.155-157.
[30]. Ravichandran C., Suthabala S and Jayalakshmi S. Environmental Quality of Selected Temple Ponds in Tiruchirappalli. *IJEP* 29(5): 2009 pp.392-398.
[31]. Sayeswara H.A., Mahesh A.G. and Manjunatha R. Water quality evaluation and phytoplankton diversity of Hosahalli Pond, shivamgga, Karnataka (India). *Int. J. chem.Sci.*:9(2), 2011pp.805-815.
[32]. Senthilkumar R. and Sivakumar K. studies on phytoplankton diversity in response to abiotic factors in Veeranamlake in the Cuddalore district of Tamil Nadu. *J.ofEnvironl. Biol.* 29.(5): 2008 pp.747-752.
[33]. Sharma Riddhi, sharmaVipul, Sharma MadhuSudhan, VermaBhoopendra Kumar, ModiRachana and Gaur Kuldeep Singh,. Studies on Limnological Characteristic, Planktonic diversity and fishes (Species) in Lake Pichhola, Udaipur, Rajasthan (India).*Uni. J. of Envl. Res. and Tech*. vol. 1 Issue 3: 2011 pp.274-285.
[34]. Sulbha, V. and Prakasam, V.R. Limnological feature of Thirumullavarm temple pond of Kollam Municipalty, Kerala. *J. Environ. Bio.,*7(): 2006 pp.449-451.
[35]. Tidame S.K. and Shinde S.S. Studies on seasonal variations in physico chemical parameters of the temple pond Nasik District (MS), India.*Int. Multidisciplinary Res. J.*Vol 2(5): 2012 pp.29-32.
[36]. Vidhya Lakshmi A. and Avinash V.S. Physicochemical Parameters and water quality Indices of certain Temple Tanks of Mysore, India. *World J. of Environl.Biosci*. Vol.3 Issue 2: 2014 pp.88-96.

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