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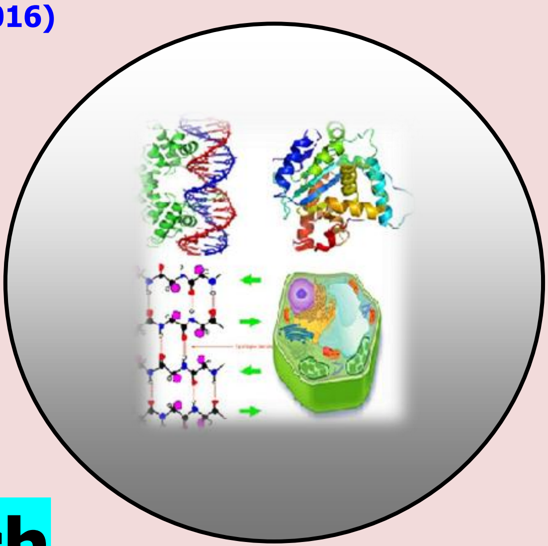

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RESEARCH PAPER

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Preliminary Investigation of Physico-chemical Parameters and Plankton Biodiversity of Recreational Lake Tilyar, Rohtak (Haryana) India

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ABSTRACT

The present research work has been carried out to study the various physico–chemical characteristics and plankton biodiversity of the recreational lake Tilyar (district Rohtak, Haryana). Water samples and plankton samples were collected fortnightly from three different sampling stations of the Tilyar Lake for a period of six months. Samples were analyzed for water quality parameters, phytoplankton as well as zooplankton composition and distribution. The physico-chemical parameters of water such as air-temperature, water temperature, pH, Turbidity, electrical conductivity, total dissolved solids, total hardness, calcium, magnesium, salinity, dissolved oxygen, free carbon dioxide, BOD, orthophosphate, sulphate and ammonia were observed. A total of 37 genera of phytoplankton species belonging to three classes of algae were identified. Among these 16 belong to Cyanophyceae, 16 genera to Chlorophyceae, and 4 genera to Bacillariophyceae. A total 22 genera of zooplankton were recorded; of which Rotifers were abundant followed by Branchipods and Copepods. Species diversity indices (Shannon-Weaver diversity and Simpson's dominance index), plankton density and species richness were calculated. To the best of our literature search this was the first study (as there are no research records found till 2009) which assessed the physico-chemical parameters and plankton biodiversity of the Recreational Lake Tilyar.

Keywords: Tilyar Lake, Physico-chemical parameters, Phytoplankton and Zooplankton.

INTRODUCTION

Water is the indispensable source, to sustain life and has long been suspected of being the source of much human illness. A lake is indirect description of its watershed and as watershed landscape. The topography, soil, geology and vegetation determine the types of materials entering into the lake that in turn describes its water quality (Dong et al., 2010). The use of water bodies for recreational purposes is one of the most important aspects of eco-tourism around the world. India is facing serious problems of natural reservoirs especially water, due to rapid population growth and economic conditions (Garg et al., 2009). The urban lakes are important in maintaining the surface and ground water balance, in maintaining urban ecosystem apart from its uses for different purposes namely recreational, water supply, and fishing etc. (Snehal and Unnati, 2012).

Hydrology concerns the quality, duration, rates, frequency and other properties of water flow. Urbanization typically increases runoff peak flows and total flow volumes and damages water quality and aesthetics. Water quality in water bodies generally has a positive effect on tourism and recreation (Mihalic, 2000; Puczko, et al., 2000). Anthropogenic activities such as illegal construction, litter, domestic discharge, and recreational use of lake water are major concerns for sedimentation and eutrophication of the lake water (Purushothaman et al., 2012). Water quality monitoring helps in evaluating the nature and extent of pollution control measures already in existence. It also helps in drawing the water quality trends and prioritizing pollution control efforts (Bharadwaj, 2005). The biodiversity of lake and pond ecosystems is currently threatened by a number of human disturbances, of which the most important include increased nutrient load, contamination, acidification and invasion of exotic species (Bronmark and Hansson, 2002). The seasonal variations in the ecological parameters produce a strong influence on the distribution and population density of flora and fauna (Odum, 1984). Assessment of biota reflects qualitative characteristic of particular water body (Gower, 1980). Therefore, conservation of aquatic systems with natural biological output is the major challenge before environmentalists, biologists and planners world over, more so in most Asian countries (Hosmani, 2012; Jaiswal, 2013). Physico-chemical parameters plays a major role in the distribution of phytoplankton in freshwater ecosystem (Sharma et al., 2016). In North India, many studies have been focussed on the Yamuna River (Chopra et al., 2012), Sutlej River (Sharma et al., 2013) and Jhelum River (Hafiz et al., 2014) however data on recreational lakes is lacking. The literature review reveals that there is no scientific study (before 2009) carried out with respect to ecological characteristics of recreational lake, Tilyar. The main goal of the research was to assess the water quality characteristics and to investigate plankton diversity, from April 2009 to September 2009.

MATERIALS AND METHODS

i. Description of study site

The man-made Tilyar Lake was brought into existence in 1976. The lake is located at 28°52’44” N Latitude and 76°38’09” E Longitude in the eastern side of district Rohtak on Rohtak-Delhi road, Haryana, India. Lake Tilyar, spread in an area of 132 (0.53 km^2) acre and mini zoo is also present in its vicinity. It has huge varieties of plant and animal species. A variety of birds species are also found that flock on the three little islands located in the middle of the lake. The total study area (Figure 1) comprised of three sampling station covering three sectors of Tilyar Lake.

Figure 1. Location map of the study area (courtesy: Google map data 2014).

ii. Collection of samples

Water samples were collected from all sampling stations and were analyzed for physico-chemical parameters. Only ambient water samples were collected from the lake at the depth of water 0.5m in plastic bottles of two litres capacity. Sampling was carried out fortnightly between late morning and early evening. At the time of samples collection in the lake, all necessary precautions had been taken to collect undisturbed water samples.

iii. Determination of water quality parameters

Physical parameters like colour, odour, floating materials, suspended materials, air temperature, water temperature and pH of the samples were determined on the spot of collection of samples.

For estimation of dissolved oxygen (DO), BOD bottles were used for the water samples and the oxygen was fixed by adding $MnSO_4$ and alkaline potassium iodide at the sampling site. The experiments were performed within seven days of collection of water samples. Chemical parameters like conductivity, total dissolved solid, calcium, magnesium, total hardness, dissolved oxygen, biochemical oxygen demand (BOD), chloride content, salinity, ammonia, ortho-phosphate, sulphate content and total alkalinity were analyzed in the laboratory by following standard methods; APHA (1998).

iv. Plankton estimation

For the collection of plankton samples, 50L of habitat water from approximately 10-12 cm below the surface level was filtered through plankton net (mess size 50µm) with attached collecting tube. The population of plankton accumulated in the container were then transferred to other bottle and immediately preserved in 4% buffered formaldehyde solution soon after collection, labelled and then transferred to laboratory for further experimentation. Each sample was stirred smoothly just before microscope examination. Phytoplankton and zooplankton were identified by using classical literatures and text books [APHA, (1998); Prescott (1954); Ward and Whipple (1959); Needham and Needham, (1962); Anantani and Marathe (1972); Gupta (1972); Pandey et al., (1993); Kumar and Singh (1995); Garg et al., (2002)]. Plankton density was estimated by Drop count method. Shannon and weaver diversity index (Shannon and Weaver, 1963) and Simpson diversity index (Simpson, 1949) were used for calculating species diversity.

v. Statistical Analysis:

Monthly mean and standard deviation was calculated for each physical, chemical and biological variable. The data of all the three sampling stations has been pooled and shown in tables and figures. All the data presented in the tables are mean of the triplicate samples with standard deviation. SPSS software was used for data analysis.

RESULTS AND DISCUSSION

i. Physico-chemical parameters:

The physico-chemical parameters of water samples collected from the lake are presented in tabular form (Table 1). The collected water samples were found to be colourless and odourless in sample bottles but it appeared to be greenish in colour. Floating materials like debris of algae and dust particles were observed in most of the collected samples. **Temperature:** The average water temperature was 29.58°C ±1.23. Even distribution of temperature was observed in all the sampling stations. Water temperature followed a pattern similar to that of the air. Water temperature of 13.5 - 32°C is found to be suitable for the development of planktonic organisms (Gaikwad et al., 2008). **pH:** In the present study, pH ranged from 8-8.50, showing alkaline nature of lake and indicated that waters were well buffered and in high tropic status. It is reported that the pH range 6.0-8.5 indicate productive nature of reservoir and above 8.5 goes to highly productive (Tanner et al., 2005). During present study, in the months of May, June and August pH go to above 8.5 which indicates that the water is highly productive for zooplankton population.

TDS: The average concentration of TDS was 140.70±19.12 mg/L. TDS indicate the total amount of inorganic chemicals in solution. The portion of dissolved solids has bicarbonates carbonates and chlorides of sodium and calcium. TDS concentration was within permissible limits. **Turbidity:** The mean concentration of turbidity was 17.58±9.48 mg/L. Comparatively higher value of turbidity was recorded in July-September months. In the same months peak of phytoplankton density and rise in suspended matter contributed by decomposed aquatic vegetation was also observed. It may be due rain which bring clay, silt and organic matter. Our findings are in accordance with an earlier study (Iqbal et al., 2004). **Conductivity:** The average conductivity was 308.94±81.85. Conductivity is influenced by several factors like temperature, ionic mobility and ionic valencies. In turn conductivity reflects presence of total dissolved solids concentration and salinity of water (Odum, 1971). **Total Hardness:** The average value of hardness was found to be 86.11±10.79 mg/L. **Calcium:** Comparatively higher value of calcium was found in July and August. The highest content was in the monsoon due to carry of calcium along with run off (Siddamalayya and Pratima, 2008). **Magnesium:** The average concentration of magnesium was 21.06±10.58 mg/L. The lowest Mg concentration was noticed during monsoon months and the highest was in the summer months. It may be due to evaporation by high atmospheric temperature (Siddamalayya and Pratima, 2008). **Chloride:** The mean concentration of chloride was found to be 17.10±3.72 mg/L. High chloride concentration reflected the high amount of organic waste of animal origin. With some exceptions, fishes are less sensitive to chloride exposure than small free floating planktonic crustaceans (Evans and Frick 2001).

Free CO_2: During the present study period, free CO_2 ranged from 0.00-5.0. Low concentration implies the utilization of CO_2 by phytoplankton of the lake. Absence of free CO_2 during most of the study period coincided with the presence of carbonate and due to luxuriant growth of algae. The maximum value of free CO_2 in monsoon months may be due to rain and increase in number of overgrazing micro-organisms (Shastri, et al., 2001; Siddamalayya and Pratima, 2008). **DO:** DO is one of the most important parameter and its correlation with aquatic habitats gives direct and indirect information about availability of nutrients, photosynthesis, bacterial activity, stratification etc. (Premlata and Vikal, 2009). In summer months, comparatively low DO was recorded which may be due to increase in temperature, decrease in water level and also due to increased microbial activity. Dissolved oxygen is a sole of physico-chemical parameters of the water which need to keep the organisms alive and health of the water body of ecosystem (Rao et al., 2014). **BOD:** BOD is a measure of contamination organic matter in water. The higher concentration BOD was found in the summer months which may be related with high temperature; which favors microbial metabolism (Tidame et al., 2012; Sachidanandamurthy et al., 2006; Shinde et al., 2011). **Ortho phosphate**: Comparatively lower concentration of orthophsphate was recorded in post monsoon period. **Ammonia:** The mean concentration of ammonia was 0.32±0.19 mg/L. Ammonia concentration was within limits of ICMR standards (ICMR, 1975). **Sulphate:** The mean concentration of sulphate was 0.63±0.15 mg/L. **Total Alkalinity:** The mean value of alkalinity was 66.51±9.93 mg/L. It is composed primarily of carbonate ($CO3^{2-}$) and bicarbonate ($HCO3^{-}$), alkalinity acts as a stabilizer for pH. During the sampling period, alkalinity was primarily due bicarbonates which may be because of low concentration of free CO_2. **Salinity:** The concentration of salinity was found to be zero at all the sampling stations throughout the study period. Relatively low salinity of fresh waters has influenced greatly the distribution of biota and their long evolutionary history of physiological adaptation for osmotic and ionic regulation in hypotonic environment.

ii. Plankton diversity

In the aquatic ecosystem plankton play a critical role not only in converting plant food to animal food but also serves as source of food for their organisms (Rajashekhar, et al., 2010). Phytoplankton (37) and zooplankton (22) genera identified from samples taken from all the three sampling stations were similar for the three sites (Table 2 and 4). This was probably because of the similar type of environment and stagnant conditions that has prevailed in this shallow freshwater lake for years.

Table 1. Physico-chemical parameters of Tilyar Lake during the study period.

S. No	Parameters	Unit	Mean ± SD	Max.	Min.
1	**Water Temperature**	°C	29.58±1.23	29.82	29.33
2	**pH**	-	8.48±0.25	8.51	8.46
3	**TDS**	mg/L	140.70±19.12	143.20	137
4	**Turbidity**	NTU	17.58±9.48	18.22	16.90
5	**Conductivity**	µmhosCm^{-1}	308.94±81.85	310.3	307.2
6	**Total Hardness**	mg/L	86.11±10.79	88.25	82.17
7	**Calcium**	mg/L	21.10±2.72	21.86	20.54
8	**Magnesium**	mg/L	21.06±10.58	33.65	11.60
9	**Chloride**	mg/L	17.10±3.72	18.92	15.79
10	**Free CO_2**	mg/L	1.72±2.38	2.17	1.33
11	**DO**	mg/L	3.92±0.88	4.058	3.80
12	**BOD**	mg/L	2.00±0.28	2.033	1.98
13	**O-phosphate**	mg/L	0.26±0.19	0.311	0.18
14	**Ammonia**	mg/L	0.32±0.19	0.365	0.296
15	**Sulphate**	mg/L	0.63±0.15	0.668	0.59
16	**Alkalinity**	mg/L	66.51±9.93	66.85	65.83

Total dissolved solids (TDS), Carbon dioxide (CO2), Dissolved oxygen (DO), Biochemical oxygen demand (BOD), Ortho-phosphate (O-phosphate), Standard deviation (SD)

Phytoplankton

A total of 37 phytoplankton genera, belonging to three phyla, were recorded for the first time during the study period.

Table 2. Check-list of Phytoplankton found in Tilyar Lake

S. No	Phylum	Class	Order	Family	Genus/Species
1	Cynophyta	Cynophyceae			*Chrococcus* sp.
2					*Synechocystis* sp
3					*Synechococcus* sp.
4			Chroococcales	Chroococcaceae	*Microcystis* sp.
5					*Gomphospheria* sp.
6					*Oscillatoria* sp.
7					*Phormidium* sp.
8					*Aulosira* sp.
9					*Rivularia* sp.
10					*Nodularia* sp
11					*Entophylais* sp.
12					*Lyngbya* sp.
13					*Phytoconis* sp.
14			Chroococcales		*Merismopedia* sp.
15			Nosocales		Aphanizomenon sp.
16					*Gomphosphaerioidea sp*
17	Chlorophyta	Chlorohceae			*Tetraspora* sp.
18					*Eudorina* sp.
19					*Chlorella* sp.
20					*Volvox* sp.
21					*Chlorochytium* sp
22					*Crucigenia* sp.
23					*Oocystis* sp.
24					*Closteriopsis* sp.
25					*Microspora* sp.
26					*Cladophora* sp.
27					*Ulothrix* sp.
28					*Stigeoclonium* sp.
29					*Oedogonium* sp.
30					*Zygenema* sp
31					*Spirogyra* sp.
32					Closterium sp
33	Heterokontophyta	Bacillariophyceae			*Cyclotella* sp.
34					*Cymbella* sp.
35					*Navicula* sp.
36					*Pinnularia* sp.
37		Diatoms			*Fragillariopsis* sp.

In the present study, the phytoplankton community in fresh water was represented by members of Cyanophyceae, Chlorophyceae and Bacillariophyceae as represented in Table 2. The percentage distribution of phytoplankton is shown in Figure 2. In order to apply biological means of determining the trophic status, species richness, phytoplankton density, Shannon and Weaver's species diversity and Simpson dominance values were calculated (Table 3). The phytoplankton members were comparatively higher in summer months and the lake looks dark green. During summer months the temperature, pH and light intensity were high resulting in higher biomass of green algae. The average phytoplankton density was found to be 28066.67±11874.9 individual/L during the study period. Phytoplankton density mostly exhibited high abundance at the surface. The highest phytoplankton density was observed in the month of July and August which may be due to the increase in temperature and influenced by seasonal variations in light intensity.

After July again, phytoplankton density decreased. Similar trend was observed by (Hamaidi-Chergui et al., 2013). Phytoplankton grow and multiply best during summer when the temperature is high (Farahani et al., 2006; Chowdhury et al., 2007) and longer photoperiod (Tyor and Chawla 2012). Memebers of Cynophyceae dominated over other phytoplankton genera, throughout sampling stations followed by Chlorophyceae and Bacillariophyceae. In case of Cyanophyta, genera of *Chrococcus sp., Synechocystis sp., Synechococcus sp.* and *Microcystis sp.* were dominant forms. In Chlorophyta algae like *Tetraspora sp., Eudorina sp., Chlorella sp., Volvox sp., Chlorochytium sp.* and *Crucigenia sp.* were the dominant forms collected throughout the study period. Among Bacillariophyta *Navicula sp., Pinnularia sp.* were the dominant forms. In term of percentage composition, the Cyanophyceae (57.76%) were found to be the most diverse class followed by Chlorophyceae (24.13%) and Bacillariophyceae (Figure 2). The highest population of Cyanophyceae may be due to variation in nutrient and other favourable conditions of water during plankton production.

Increased nutrient level by the surface runoff in the monsoon provides food to the members of Cynophyceae. Cyanophyta dominance and sometimes bloom formation are among the most visible symptoms of accelerated eutrophication of lakes and reservoirs (Stoyneva, 2003). During monsoon months, the poor growth of Chlorophyceae may be due to cloudy weather, surface runoff with rainy and absence of sufficient sun light.

At all sampling stations, phytoplankton population was most abundant during May and June and the lake looks dark green. During summer months light intensity, temperature and pH were high resulting in comparatively higher biomass of green algae (Murugesan and Sivasubramanian, 2008).

In Tilyar Lake, *Navicula sp., Scenedesmus sp., Microcystis sp., Oscillatoria sp., Anabaena sp., Closterium sp.* were found. These species have also been reported from eutrophic water bodies (Pundhir, and Rana 2002). Except *Microcystis sp.,* population density all these genera was lower which may be due to less concentration of phosphate, calcium and nitrogen which influence the growth of these genera (Nandan and Aher 2005). It is reported that *Closterium sp.* and *Scenedesmus sp.* are found in meso-trophic water bodies (Tiwari and Chauhan 2006; Chellappa et al., 2008) while some specific phytoplankton organisms (e.g. *Merismopedia sp.*) indicates and suggest that oligo-eutrophic nature. Similar results were registered by some earlier researchers (Rajagopal et al., 2010). Diversity indices can serve as a good indicator of the overall pollution of water. For Indian lakes, the Shannon- Weaver diversity index proposed as diversity index greater than (> 4) is clean water; between 3-4 is mildly polluted water and less than 2 (< 2) is heavily polluted water (Shekhar et al., 2008). In the present study, it was found that the Shannon-Weaver index was lowest in the month of April (1.22±0.97) and highest in September (1.97±0.27). Simpson's dominance index was highest in April and lowest in the months of June and August. Similar observations were found in Wular Lake of Lankrishipora, Kashmir (Ganai and Parveen, 2014). The Shannon–Wiener index of species diversity for the whole planktonic community was found to be decreased with the increase in eutrophication (Paturej, 2006).

Table 3. Monthly variation of phytoplankton species richness, density and diversity indices in Tilyar Lake.

Months	Phytoplankton							
	Richness		Density (individuals/L)		Shanon-Weaver Diversity index		Simpson's Dominance Index	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
April	5.67	0.58	28066.67	11874.9	1.22	0.97	0.48	0.34
May	27.33	4.62	87766.67	27957.88	1.84	0.05	0.29	0.08
June	27.33	5.52	100633.3	24725.76	1.95	0.27	0.21	0.05
July	25.01	5.19	139200	46074.18	1.81	0.15	0.24	0.04
August	16.67	1.15	178433.3	86184.12	1.87	0.22	0.21	0.04
September	12.01	1.73	121500	29913.37	1.66	0.13	0.26	0.04

Zooplankton

Zooplankton considered as the basic principle natural fish food for young and some adults of organisms, which support fish production (El-Serafy et al., 2009). The checklist of the zooplankton species at the Tilyar Lake is presented in Table 4. The percentage distribution of zooplankton is shown in Figure 2. Species richness, zooplankton density, Shannon and Weaver's species diversity and Simpson dominance for the three sampling stations are presented in Table 5. It has been observed that the zooplankton abundance frequently reach their peak during the wet season in ponds (Muylaert, et al., 2003).

Five groups of zooplankton viz., Protozoans, Rotifers, Ostracopods, Copepods and Branchipods, were found during the present study. Zooplanktons were dominated by Rotifer's genera followed by Copepods, Branchipods, Protozoans and Ostracopods. Similar pattern was observed in Veeranam Lake, Tamil Nadu and reservoirs of North-West Bulgaria (krishnamoorthi et al., 2012; Dimitar et al., 2013). Protozoans were represented by *Vorticella sp.* and *Glenodinum sp.* Protozoans were reported in low numbers and in all sampling stations. This may be an indication of the consumption of protozoans by other planktonic forms and fish larvae. Rotifers were represented by *Brachionus sp., Filinia sp., Anuraeopsis sp., Keratella sp., Mytilina sp., Lepidella sp., Lacena sp. Monostyla sp., Philodina sp.* and *Trichocera sp.* Rotifers showed superiority over other groups (Figure 2) both in terms of number of species and population density. Rotifer's dominance was also found in Veeranam lake, Tamil Nadu (krishnamoorthi et al., 2012). In Copepods most numerously were represented by *Nauplius sp., Cyclops sp.* followed by *Diaptomus sp.,* and *Sida sp.* Branchipods were dominated by *Daphnia sp., Moina sp., Leydigia sp., Chydorus sp.* while Protozoans and Ostracopods were particularly scarce during sampling period (Table 4). Zooplankton density (average) varied from 9266.667±2362.91 to 16733.33±6457.81 individual/L (Table 5). The population density and diversity of rotifers were comparatively lower during monsoon months which may be due to dilution of water which results in reduced nutrients or could be due to depletion of transparency of water, and pH (Kedar and Patil 2002; Jeelani et al., 2005). The abundance of rotifers may be attributed to its dependence on phytoplankton and decomposed matter as food (Jussain et al., 2011).

Table 4. Check-list of Zooplankton found in Tilyar Lake.

SNo	Phylum	Class	Order	Family	Genus/Species
1	Ciliophora	Oligohymenophorea	Oligohymenophorea	Vorticellidae	*Vorticella sp.*
2		Dinophyceae	Thoracosphaerales		*Glenodinum sp.*
3	Rotifera	Monogononta	Plioma	Brachionidae	*Anuraeopsis sp.*
4		Monogononta			*Branchionus sp.*
5		Eurotatoria	Ploima	Brachionidae	*Keratella sp.*
6		Eurotatoria	Flosculariaceae	Trochosphaeridae	*Filinia sp.*
7					*Lepidella sp.*
8					*Monostyla sp.*
9			Ploima	Mytilinidae	*Mytilina sp.*
10				Philodinidae	*Philodina sp.*
11				Trichoceridae	*Trichocera* sp.
12	Arthropoda	Maxillopoda	Cyclopoida	Cyclopidae	*Cyclops sp.*
13			Calanoida		*Diaptomus sp.*
14					*Nauplius sp.*
15					*Sida sp.*
16		Ostracopoda	Podocopodia	Cyprididae	*Cypris sp.*
17		Branchiopoda	Cladocera	Daphniidae	*Cerodaphnia sp.*
18					*Daphnia sp.*
19				Moinidae	*Moina sp.*
20			Diplostraca	Chydoridae	*Leydigia sp.*
21					*Chydorus sp.*
22	Juvenile stages				Nauplii larva
23					Copepod eggs

Among Rotifers genus *Brachionus* was found to be dominant which indicates nutrient rich water body which may undergo the state of eutrophication (Bharati et al., 2014). Dominance of Rotifers and the genus *Brachionus* were also observed in Rakaskoppa reservoir of Belgaum, North Karnataka; freshwater lake of Nagpur; mangrove swamp of River Krishna estuarine region, Andhra Pradesh; and Pethwadaj dam of nanded District in Maharashtra (Sitre, et al., 2012; Pawar S.K. and J.S.Pulley 2005). The Shannon-Weaver index showed high faunal diversity in summer and monsoon months at all the sampling stations. In spite of large number of genera only a few numerically abundant genera contributed maximum to the zooplankton density. The overall pattern of species diversity exhibited general trend as reported by early researchers in the fresh waters.

Table 5. Monthly variation of zooplankton species richness, density and diversity indices in Tilyar Lake.

Months	Zooplankton							
	Richness		Density (individuals/ L)		Shanon-Weaver Diversity index		Simpson's Dominance Index	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
April	11.67	4.04	14633.33	6280.39	1.22	0.22	0.41	0.023
May	16	2.0	16733.33	6457.81	1.48	0.28	0.33	0.076
June	18.33	2.08	15900	4014.97	1.72	0.36	0.31	0.08
July	14.67	3.51	12966.67	5484.82	1.71	0.16	0.28	0.014
August	14	2.65	10500	2946.18	1.91	0.14	0.20	0.026
September	9.67	2.30	9266.667	2362.91	1.59	0.17	0.27	0.059

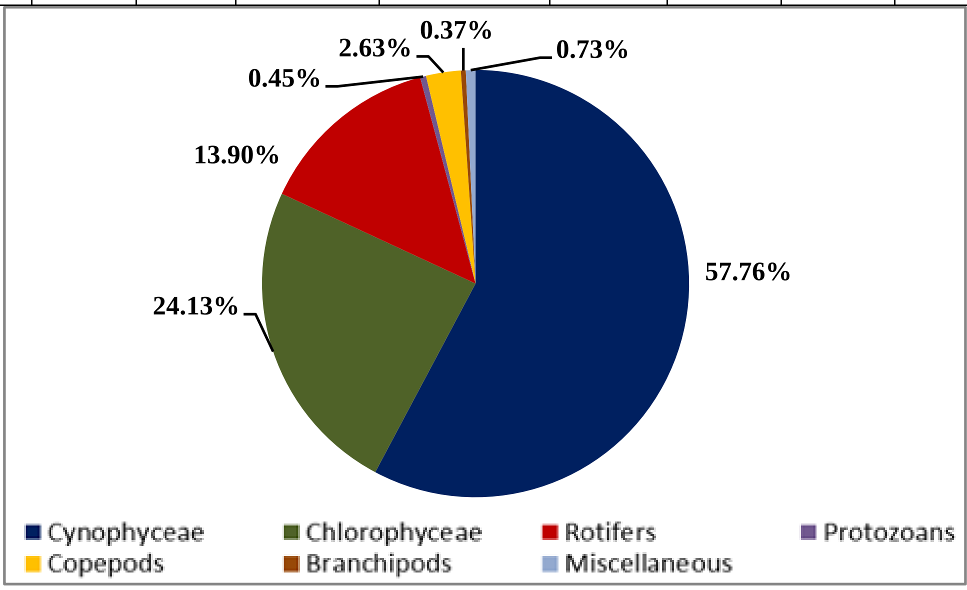

Figure 2. Species composition of different plankton groups.

CONCLUSION

As a result of this study it may be deduced that in terms of physico-chemical limnology, water of Tilyar Lake was found to be alkaline, turbid and rich in various ions. As far as biotic community is concerned, Cynophyceae (in phytoplankton) was found to be dominant which indicates eutrophic conditions of the lake. Among zooplankton, diversified Rotifer fauna of Tilyar Lake can be linked to favorable conditions and availability of abundant food in the form of bacteria, nanoplankton and suspended detritus in the lake water. Further, detailed investigation through regular monthly sampling with more quantitative analysis to conform the exact status of the lake is required which would help to conserve the plankton diversity and water quality.

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