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CORRELATION OF POPULATION DYNAMICS OF ROTIFERS AND PHYSICO-CHEMICAL PARAMETERS IN THE HANUMAN TEMPLE LAKE KURJHA, TAHSIL BRAMHAPURI (M.S.), INDIA

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ABSTRACT:
Aim of the present study is to assess the rotifer diversity, seasonal variation in the population and its correlation with physico-chemical parameters in Hanuman temple lake Kurjha. Water samples were collected on monthly basis from selected sampling site for analyzing the physic-chemical parameters and population dynamics of the rotifers in the reservoir. During present investigation, 16 species of rotifers representing 06 families and 09 genera were recorded from the Hanuman temple lake Kurjha. Eight species were belonging to the family Brachionidae, three species were belonging to Lecanidae, two species were belonging to Asplanchnidae and one species each was belonging to the family Philodinidae, Filinidae and Hexarthridae. Shannon-Weiner index was in between 3.86 to 3.98. Equitability index was 3.07 to 4.03 indicating even distribution of the species. The values of coefficient of correlation (r) indicate that, rotifer density was significantly positive with temperature (r = 0.927) and conductivity (r = 0.85).

Keywords : *Rotifer diversity, Hanuman temple lake Kurjha, physico-chemical parameters.*

INTRODUCTION:

Zooplanktons are the most important organisms due to their significant role in the productivity of the in the aquatic ecosystem. They provide the major link in the aquatic food chain. Zooplanktons play a key role in the food web and turnover of the organic matter of the aquatic bodies. Zooplankton communities respond quickly to environmental change because of their short life cycle (Sharma et al., 2007). Thus these are the good indicators of the fluctuation in the physic-chemical characteristics of the water bodies. Zooplankton community gets altered in response to the changes in the physic-chemical characteristics of the water bodies. Among zooplanktons rotifers are the indicators of the pollution and trophic state of the lakes (Fafioye and Omoyinmi, 2006). The population of rotifers increases with the increase in the degree of eutrophication. Thus the abundance of rotifers is directly proportional to the degree of eutrophication. (Walz et al, 1987., Wen et al., 2006; Chen et al., 2009; Wang et al., 2009; Guo et al., 2010). Hence the study of the population dynamics of the rotifers in relation with the physic-chemical characteristics of the water bodies become necessary to ascertain the trophic status of the Hanuman temple lake Kurjha and evaluation of correlation between physic-chemical variables and the density of rotifers community.

METHOD AND MATERIAL:

Hanuman temple lake Kurjha one of the fresh water lake situated in the north of the Bramhapuri (79° 51' 44.1" E longitude , 20° 37' 42.2" N, lattiitude and at 227 m (M.S.L) altitude. Collection of sample was done on monthly for 6 months from January 2016 to June, 2016 around 7.00 to 7.30 a.m. from selected site using a 55µ pore size bolting nylon plankton net and further identification was carried out by using Standard literature. All specimens collected were preserved in 4 % formalin soon after collection. Identification of the specimens was performed according to Kolisko (1974); Koste (1978); Ward & Whipple (1959); Mizuno (1964); Mizuno and Takahashi (1991), Battish (1992) and Dhanapathi(2003). The

collection and analysis of various physic-chemical parameters of water samples were carried out by following the standard methods (APHA, 2005; Saxena, 1994; Manivasakam, 1982; Trivedy and Goel, 1986). Triplicates of each analysis were performed and mean values were used for calculation. Six indices were used to estimate biodiversity and species richness. Species diversity index was calculated based on Simpson (1949) and Shannon-Weiner(1949); richness index was adopted by Margalef (1951) and Menhinic (1964) and equitability Index by Magurran (1988). Dominance index or Simpson's index of diversity was calculated using formula 1- Simpson index.

STATISTICAL ANALYSIS

The correlation between the rotifers with the physicochemical variables was analyzed by using SPSS version 10. All graphs in this study were drawn using Microsoft Excel Software.

RESULTS AND DISCUSSION

Rotifera is a group of planktons which comprises about 92% to 98% of water and does not have either exoskeleton or endoskeleton (Dumont, 2007). There are 2030 rotifera species present throughout the world (Segers, 2007) which inhabits the diverse zones in a aquatic ecosystem (Pejler, 1995). A total of 16 species of rotifers representing 06 families and 09 genera were recorded from the Hanuman temple lake Kurjha. The recorded species are represented in Table 1. Among family philodinidae single species have been observed that was *Rotaria rotatoria*, brachionidae was represented by three genera and eight species. These were *Brachionus bidentata, B. falcatus, B. ureceolaris, B. forficula, Platyas quadricornis, Keratella tropica, Keratella vulga and Keratella cochlearis*. Family Lecanidae was represented by two genera and three species. The species identified were *Lecane arculata*, *Lecane obtuse* and *Monostyla obtuse*. Asplanchnidae was represented by only single genus and two species that are *Asplanchnaa priodonta* and *Asplanchnaa brighwelli*. Family Filinidae and Hexarthridae was represented by only single genus that is *Filinia longiseta* and *Hexarthra species* respectively. Among rotifers genus *Brachionus* was recorded as a most dominant species. During entire study period *B. falcatus*, *B. ureceolaris*, *Keratella vulga*, *Lecane arculata*, *Filinia longiseta* were recorded abundantly in the Hanuman temple lake Kurjha.

Rotifer density recorded during the study was 45 to 132 organisms lit^{-1} with maximum density in summer and minimum in winter season (Figure 1.). Maximum population of Rotifer during summer season may be due to increased rate of decomposition of organic matter in summer season (Malhotra *et al.*, 1987). Increase in temperature during summer days favours the growth of macrophytes and algae in the lake, which serve as a microhabitat (Arora and Mehra, 2003) and food material to the rotifers repectively (Devetter and Sed'a, 1905; Temerova et al., 2002; Sellami et al., 2009). Thus increasing the population of rotifers during summer. The physico-chemical parameters of water and Mean ± standard error of Hanuman temple lake Kurjha have been given in the Table 2.

The diversity indices during study period are presented in Table 3. Values of Simpson index ranged from 0.0512 to 0.0642. Dominance index varied from 0.9488 to 0.9381. Shannon- Weiner index was in between 3.86 to 3.98. Margalef richness index values varied from 1.393 to 2.49. Menhink index was least (0.965) during winter and highest (0.983) during the summer season. Equitability index was minimum during summer (3.07) and highest during winter (4.03).

Values of coefficient of correlation (r) of rotifer density with physico-chemical parameters are shown in Table 4. The values of coefficient of correlation (r) indicate that, rotifer density was significantly positive with temperature (r = 0.927) and conductivity (r = 0.85). It was positively correlated with hardness, transparency, pH and BOD. However significant negative correlation exists with dissolved oxygen (r = -0.795) at 5% level of significance. Similar observations were recorded by May, 1983; Bērzinš and Pejler, 1989; Sellami et al., 2009 who has suggested that water

temperature was the most important factor in determining seasonality and density of rotifer. However our results are not in agreement with the observations of Sharma (2009) in Loktak lake.

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Table 1: Rotifer species identified in Hanuman temple lake Kurjha.

Sr. No.	Rotifera	
1.	Family: Philodinidae	*Rotaria rotatoria*
2.	Family: Brachionidae	*Brachionus bidentata*
3.		*B. falcatus*
4.		*B. ureceolaris*
5.		*B. forficula*
6.		*Platyas quadricornis*
7.		*Keratella tropica(Apstein)*
8.		*Keratella vulga*
9.		*Keratella cochlearis*
10.	Family: Lecanidae	*Lecane arculata*
11.		*Lecane obtuse*
12.		*Monostyla obtuse*
13.	Family: Asplanchnidae	*Asplanchnaa priodonta*
14.		*Asplanchnaa brighwelli*
15.	Family: Filinidae	*Filinia longiseta*
16.	Family: Hexarthridae	*Hexarthra species*

Figure 1. Radar diagram showing monthly density of Rotifers (Org Lit^{-1}) in Hanuman temple lake Kurjha during January, 2016 to June, 2016.

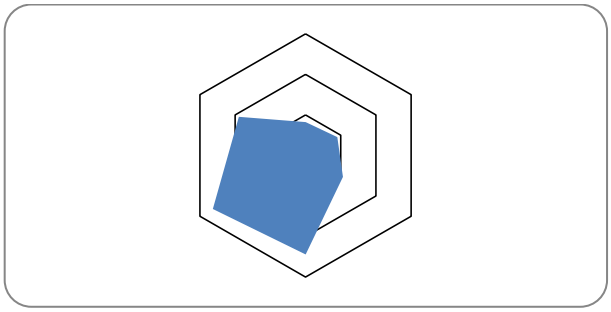

Table 2. Range of variation, Mean ± standard error of the physico-chemical characteristics of water of Hanuman temple lake Kurjha during January, 2016 to June, 2016.

S. No.	Parameter	Unit	Range of Variation		Mean ± Std. Error
			Min	Max	
1.	Water Temp.	^{0}C	20.1	28.7	24.36 ± 1.47
2.	pH	--	7.4	8.3	7.76 ±0.12
3.	Transparency	Cm.	23.4	31.1	27.5 ± 1.26
4.	Electrical Conductivity	µmho Cm^{-1}	251	470	389.33 ± 32.78
5.	Dissolved Oxygen	mgL^{-1}	5.6	7.9	7.03 ± 0.39
6.	Total Hardness	mgL^{-1}	116	155	133.83 ±5.54
7.	B.O.D.	mgL^{-1}	4.2	8.9	5.58 ± 0.68

Table 3. Diversity indices of Hanuman temple lake, Kurza during January, 2016 to June, 2016.

Month	Simpson Index	Dominance index	Shannon-Weiner index	Margalef Richness index	Menhink index	Equitability Index
Jan	0.0512	0.9488	3.86	2.499	0.965	4.039
Feb	0.0515	0.9485	3.878	2.385	0.969	3.94
Mar	0.0522	0.9478	3.913	2.198	0.978	3.778
Apr	0.0642	0.9358	3.987	1.449	0.973	3.122
May	0.0618	0.9381	3.928	1.393	0.982	3.072
Jun	0.0571	0.942	3.934	1.735	0.983	3.376

Table 4. Correlation matrix of the physico-chemical variables of Hanuman temple lake Kurza during January, 2016 to June, 2016. (method = Pearson)

*The values (*r*) ranging from 0.707 and above , 0.834 and above are significant at $P \leq 0.05$ (2-tailed) and $P \leq 0.01$(2-tailed), respectively.

r	Temp	PH	Transparency	Conductivity	DO	Hardness	BOD	Density Org./ Lit
Temp	1							
PH	0.746	1						
Transparency	0.452	-0.159	1					
Conductivity	0.916	0.767	0.49	1				
DO	-0.632	0.025	-0.936	-0.54	1			
Hardness	0.817	0.957	0.027	0.861	-0.148	1		
BOD	0.377	0.821	-0.573	0.378	0.422	0.781	1	
Density Org./ Lit	0.927	0.544	0.647	0.85	-0.795	0.698	0.19	1