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Seasonal Variations on Plankton Diversity in Relation to Physico-Chemical Parameters of a Pond Ecosystem at Keekozhoor, Emerged by Pamba Irrrigation Project, Pathanamthitta, Kerala.

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Abstract

Ponds are among the most significant water assets with multiple human utilization and ecological relevance. This investigation was intended to evaluate the pond water quality, giving stress to the analysis of microscopic pond life in the selected pond of Keekozhoor, Pathanamthitta District, Kerala. In the current examination, an endeavour has been made to study the seasonal variations in the plankton community, their diversity and physico-chemical parameters, *viz.* pH, dissolved oxygen, nitrite, chloride, sulphate and phosphate. A sum of 40 genera of phytoplankton and 12 genera of zooplankton were distinguished from various classes during pre-monsoon (March-April) to post-monsoon (May-June) seasons in 2018. Among the distinguished phytoplankton, Chlorophyceae shaped the predominant gathering with 17 genera of the complete phytoplankton network in pre monsoon and 30 genera in post monsoon individually. Among the distinguished zooplankton, protozoans established the most predominant gathering with 6 genera of the total zooplankton community in both pre monsoon and post monsoon periods. The information acquired by analysing physico-compound parameters was utilized to compute the water quality index. The outcomes were assessed and contrasted with WHO and BIS water quality norms and was discovered that the examples are falling under extremely helpless classification; consequently, not appropriate for local purposes. Hence, the current outcome gives an essential documentation of the plankton community, its diversity and basic understanding of the trophic status of the pond ecosystem.

Key words: *Plankton, physico-chemical parameters, Water Quality Index (WQI), correlation study.* **Article History:** Received 24 May 2021; Revised 12 June 2021; Accepted 15 June 2021; Published 25 June 2021.

1. Introduction

Ponds are freshwater biological systems which incorporate biotic and abiotic parts. A solid biological system relies upon these segments. The nature of water is a significant angle, as the low quality of water will antagonistically impact the ordinary capacity in all the frameworks. Both surface and ground water contain a great deal of disintegrated polluting influence and suspended materials. Subsequently it is exceptionally important to find out the nature of water before its use. Water quality in the aquatic environment is dictated by numerous physical, chemical and biological factors. The physico-chemical parameters, for example, pH, Dissolved oxygen, Chloride, Sulphate and so forth shift with various environments. These elements decide the water quality which thusly impacts the endurance and presence of the planktonic network.

Phytoplankton speaks to the minute algal networks of water bodies. The efficiency of a biological system is straight forwardly identified with the decent variety of phytoplankton. Phytoplankton is a decent pointer of trophic status of an aquatic ecosystem [1]. The seasonal variations of physico-chemical parameters decide the decent variety of phytoplankton. The phytoplankton species have distinctive physiological pre requisites and accordingly demonstrate differing reactions to physico-chemical parameters like pH, Dissolved Oxygen, Nitrite, Chloride, Sulphate, Phosphate and so on. They assume a vital job and may fill in as bio indicators and for deciding the status of water contamination.

Zooplankton is a little creature that coasts unreservedly in the water segment basically controlled by water flows. The size of these life forms ranges from a few tens of microns to > 2mm. The different functional aspects of an aquatic system, for example, food chains, food webs, energy flow and cycling of matter are affected by the zooplankton individuals, which are significant biotic segments of an aquatic framework. All the secondary production in aquatic ecosystems legitimately or in a roundabout way depends on them. Their conveyance is connected with a complex of components, for example, change of climatic conditions, physical and chemical parameters and vegetation spread. They assume a fundamental job and may fill in as bioindicators and for deciding the status of water contamination. Consequently, plankton association, richness, abundance, seasonal variation and diversity can be utilized for the evaluation of water quality. Henceforth an investigation was led to evaluate the plankton

diversity alongside their correlation with the physicochemical parameters to improve comprehension of the structure and function of this important aquatic ecosystem. The point of the current investigation is to choose a disregarded pond ecosystem and study its physical, chemical and biological attributes and to evaluate the trophic status of the pond so as to recommend conservation strategies to save such a vulnerable ecosystem.

2. Materials and methods

Study Area: Keekozhoor is a village in Ranni Block in Pathanamthitta District of Kerala State, India which is 9.3523° N, 76.7697° E **(Fig.1).** It goes under Cherukole Panchayath, having a place with the South Kerala Division. The selected pond lies at the core of the town and the closest milestone to the pond is St. Peter's and St. Paul's Orthodox Church.

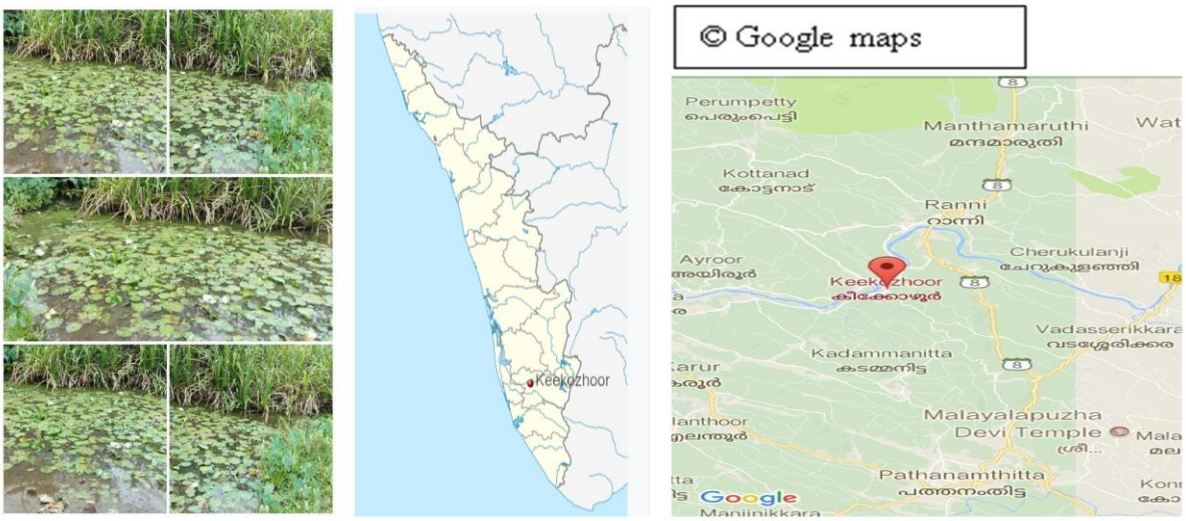

Figure 1. Different views of the selected site-pond at Keekozhoor, emerged by Pamba Irrigation Project, (Left) and Google map of Keekozhoor, Pathanamthitta District (Right) [2]

Collection of samples: The investigation has been done for a time of four months from March-April (pre monsoon) and May to June (post monsoon) 2018. Five sampling sites were chosen from the pond. The water and algal samples were gathered from the chose locales at standard timespans of 3-4 weeks between 8.00-10.00 am. Water samples were gathered in sterile polyethylene bottles, marked and brought to the lab for additional examination. In the

research centre the samples were kept in cool and dim spots until the entire investigation was finished.

LABORATORY ANALYSES

For physicochemical parameters: Physico-chemical parameters *viz* pH, carbon dioxide, chloride, dissolved oxygen, phosphate, nitrite and sulphate were examined adhering to the strategies endorsed in Standard Method for Estimation of Water and Waste Waters [3].

Plankton analysis and their relationships with physicochemical parameters:

For the qualitative analysis of phytoplankton, the samples were sifted utilizing plankton net and gathered in clean plastic containers. Epilithic algae were scrapped from the stones at the base of pond soil and the epiphytic algae found attached to floating macrophytes were also collected. For the examination of zooplankton, the examples gathered from soil and those acquired by scratching the underside of floating macrophytes were blended in with distilled water preceding perception under microscope.

Specimens were preserved in buffered formaldehyde (4%) and afterward put away in dim and cool conditions until the hour of investigation. Photos of the phytoplankton specimens were taken with exceptional reference to the apical, basal cells and the chloroplast. Phytoplankton were identified up to the genus level following the classifications of Cyanobacteria and Algae-Fritsch [4], Freshwater algae-Prescott [5], Cyanophyta-Desikachary [6] and Freshwater microalgae-Anand [7] and zooplanktons following the classification of Free-Living Protozoa- Patterson [8]. The Observation was carried out with the aid of light microscope (Labovision, MEDSTAR) 10X/40X magnification.

So as to assess the species diversity, all the various genera of plankton were identified and counted individually. The relationship between the planktons and the physico- chemical parameters of their habitat are analysed critically. Paired t-test was done to analyse statistically where there is any significant difference between the estimated values of physicochemical parameters got in the pre-monsoon period with those of the post-monsoon

period. Pearson's correlation study was additionally done to decide the relationship among physicochemical parameters and various zooplankton groups by utilizing SPSS programming. Palmer`s pollution index [9] and Nygaard`s topic state indices [10], were utilized for the assessment of tropic status and for rating of water samples for high or low organic pollution respectively.

Water Quality Index (WQI): The computation of WQI was finished utilizing a weighted arithmetic index method [11].

$q_n = [100(V_n - V_{i0})/(S_n - V_{i0})]$

(q_n =quality rating for the nth parameter, v_n =estimated value of the nth parameter at a given sampling station, S =standard permissible value of nth parameter, V_{i0} =ideal value of nth parameter in pure water).

Calculation of Unit Weight (W_n): The unit weights (w_n) for different water quality parameters are inversely proportional to the recommended standards for the corresponding parameters.

$W_n = k/S_n$; (W_n=unit weight for n^{th} parameter, S_n =standard value for n^{th} parameter, K=constant for proportionality).

Calculation of WQI: $WQI = \sum q\, W_n / \sum W_n$.

The calculated WQI is compared with the BIS standards to know the suitability of water for different purposes [12,13]

3. Results and discussions

Results

Phytoplankton analysis:

Phytoplankton in the open fresh water pond was represented by five classes of algae viz. Chlorophyceae, Cyanophyceae, Bacillariophyceae, Xanthophyceae and Euglenophycae. In the selected pond, 40 genera of phytoplankton members were identified. Among these Chlorophyceae framed the dominant group 47.06%, Bacillariophyceae (35.30%),

Cyanophyceae (5.88%), Euglenophyceae (5.88%) and Xanthophyceae (5.88%) in pre monsoon and Chlorophyceae (70%), Bacillariophyceae (10%), Cyanophyceae (10%), Euglenophyceae (10%) in post monsoon respectively. Chlorophycean diversity is most elevated during the post monsoon period i.e., from May-June. Genus like Oscillatoria, Anabaena and Stigonema were recorded from cyanophyceae. Chlorophyceae was represented by Tetracystis, Botryococcus, Pediastrum, Scenedesmus, Schroederia, Selenastrum, Ulothrix, Oedogonium, Bulbochaete, Netrium, Mougoetia, Sirogonium, Gonatozygon, Closterium, Cosmarium, Micrasterias, Spirogyra, Penium, Spondylosium, Staurastrum, Xanthidium, Ankistrodesmus, Tetrallantos, Nitella, Gonium and Krecheriella. Among the diatoms Cyclotella, Cymbella, Fragilaria, Melosira, Navicula, Nitzschia and Pinnularia were found. Euglenophyceae was mostly represented by Euglena, Trachelomonas and Phacus. Xanthophyceae was mostly represented by Characiopsis which demonstrated its presence in the pre-monsoon period as it were. Seasonal distribution of phytoplankton was shown in **Table 1** shows the phytoplankton community identified from pond.

Table 1. Distribution of phytoplankton in a pond ecosystem at Keekozhoor, emerged by Pamba IrrigationProject, Pathanamthitta.

Sl. No	Phytoplankton	Pre-Monsoon	Post-Monsoon
1	*Tetracystis*	-	-
2	*Botryococcus*	-	+
3	*Pediastrum*	+	-
4	*Scenedesmus*	+	+
5	*Schroederia*	-	+
6	*Selenastrum*	-	+
7	*Ulothrix*	-	+
8	*Oedogonium*	+	+
9	*Bulbochaete*	+	-
10	*Spirogyra*	+	+
11	*Netrium*	-	+
12	*Mougeotia*	+	+
13	*Sirogonium*	+	-

14	*Gonatozygon*	-	+
15	*Closterium*	-	+
16	*Cosmarium*	-	+
17	*Micrasterias*	-	+
18	*Penium*	-	+
19	*Spondylosium*	-	+
20	*Staurastrum*	-	+
21	*Xanthidium*	-	+
22	*Ankistrodesmus*	-	+
23	*Tetrallantos*	-	+
24	*Krecheriella*	-	+
25	*Gonium*	-	+
26	*Nitella*	+	-
27	*Cyclotella*	+	-
28	*Cymbella*	-	+
29	*Fragilaria*	+	-
30	*Navicula*	+	+
31	*Melosira*	+	-
32	*Pinnularia*	+	+
33	*Nitzschia*	+	-
34	*Euglena*	+	+
35	*Phacus*	-	+
36	*Trachelomonas*	-	+
37	*Oscillatoria*	+	+
38	*Anabaena*	-	+
39	*Stigonema*	-	+
40	*Characiopsis*	+	-
Total no: of species		17	30

Palmer's Pollution Index. Palmer`s pollution index of algal genera was utilized for rating water samples for high or low organic pollution. Out of the 20 genera recorded by Palmer 10 pollution tolerant genera were recorded from the pond. The total score got is

22 (pre-monsoon) and 20 (post-monsoon) and was more prominent than or equivalent to 20 affirms high organic stress and pollution which may be because of the release of domestic sewage into the pond **(Table 2).**

Table 2. Palmer`s Pollution Index of Algal Genera recorded from a pond ecosystem at Keekozhoor, emerged by Pamba Irrigation Project, Pathanamthitta

Sl. No	Genus	Index	Pre-Monsoon	Post-Monsoon
1	*Ankistrodesmus*	4	-	+
2	*Closterium*	1	-	+
3	*Cyclotella*	5	+	-
4	*Euglena*	1	+	+
5	*Melosira*	1	+	-
6	*Navicula*	3	+	+
7	*Nitzschia*	3	+	-
8	*Oscillatoria*	5	+	+
9	*Phacus*	2	-	+
10	*Scenedesmus*	4	+	+
Total			22	20

Nygaard`s Trophic State Index: The calculated values of Myxophyceae, Chlorophycean, Diatoms, Euglenophycean and Compound indices are 0.439, 0.857, 0.2, 0.333 and 1.857 respectively. The calculated values of Myxophyceae and Diatoms showed oligotrophic nature, while other quotients clearly demonstrated eutrophication in the pond **(Table 3).**

Table 3. Nygaard`s tropic state index of Algal Genera recorded from a pond ecosystem at Keekozhoor, emerged by Pamba Irrigation Project, Pathanamthitta

Sl. No	Index	Calculated Value	Nature
1	Myxophyceae	0.439	Oligotrophic
2	Chlorophycean	0.857	Eutrophic
3	Diatoms	0.2	Oligotrophic
4	Euglenophyte	0.333	Eutrophic

5	Compound	1.857	Eutrophic

ZOOPLANKTON ANALYSIS

Zooplankton composition in Keekozhoor Pond:

Among the identified zooplankton, Protozoans comprised the most dominating group in both the seasons; of which 16.67% Ciliates, followed by amoeba and Cladocera (33.33%), Tardigrada (16.67%) in pre monsoon and 83.33% Ciliates followed by 16.67% amoeba in post monsoon (Table 4). Protozoa was represented by Oxytricha, Paramecium, Stylonichia, Vorticella, Stentor, Urostyla which comes under Ciliates. Arcella, Centropyxis and Difflugia come under Amoebae. Cladocera shaped the second most abundant group of zooplankton and was represented by Daphnia sp, Macrothrix sp and tardigrade by Dactylobiotus sc

huster.

Table 4. Distribution of Zooplankton in a pond ecosystem at Keekozhoor, emerged by Pamba Irrigation Project, Pathanamthitta.

Sl. No	Group	Zooplanktons	Pre-Monsoon	Post- Monsoon
1	Ciliates	*Oxytricha*	-	+
2		*Paramecium*	-	+
3		*Stentor*	+	-
4		*Stylonychia*	-	+
5		*Urostyla*	-	+
6		*Vorticella*	-	+
7	Amoebae	*Arcella*	-	+
8		*Centropyxis*	+	-
9		*Difflugia*	+	-
10	Cladocera	*Daphnia*	+	-
11		*Macrothrix*	+	-
12	Tardigrade	*Dactyobiotus*	+	-
Total no: of species			6	6

Analysis of physicochemical parameters: The Water Quality Index was used to aggregate diverse parameters and their dimensions into a solitary score, showing an image of the water quality of Keekozhoor panchayath. Parameters viz. dissolved oxygen, pH, Sulphate, Phosphate, Nitrite and Chloride were chosen for computing WQI. The physico-chemical environment is critical for the maintenance of the structure and function of the water body. Seasonal variations of physico-chemical parameters in Keekozhoor pond, Pathanamthitta during March-April (pre-monsoon) to May-June 2018 (post-monsoon) are given in Table 5. The drinking water standards and unit weight of each parameter are given in Table 6. The water quality rating (qn) and the calculated sub index (qnwn) values are given in **Tables 7 & 8.**

Table 5. Seasonal variations of physico-chemical parameters during March-April (pre-monsoon) to May-June 2018 (post-monsoon) recorded from a pond ecosystem at Keekozhoor, emerged by Pamba Irrigation Project, Pathanamthitta

Physico-Chemical Parameters	Pre-Monsoon	Post-Monsoon
	Mean± SD	Mean± SD
pH	6.57±0.21	6.92±0.09
Dissolved Oxygen	3.47±0.16	3.51±0.1
Nitrite	5.23±0.15	3.13±0.15
Sulphate	0.43±0.08	0.16±0.03
Chloride	24.08±0.16	15.53±0.24
Phosphate	0.12±0.02	0.03±0.01

Table 6. The drinking water standards and unit weight of each parameter (all values except pH are in mg/l) as per the BIS standards

Sl. No	Parameters	Standards (S_n)	Permissible Values	Unit Weights (W_n)
1	pH	6.5-8.5	7	0.11
2	Dissolved oxygen	5	14.6	0.07
3	Nitrite	3	0.2	1.001
4	Sulphate	200	400	0.0074
5	Chloride	250	1000	0.0074
6	Phosphate	0.025	0.1	1

Table 7. Water quality (q_n) and calculated sub index (q_n w_n) values of different parameters at the site during the pre- monsoon and post-monsoon period recorded from a pond ecosystem at Keekozhoor, emerged by Pamba Irrigation Project, Pathanamthitta

Sl. No	Parameters	Pre-Monsoon		Post-Monsoon	
		q_n	q_n w_n	q_n	q_n w_n
1	pH	23.33	2.56	1.33	0.14
2	Dissolved oxygen	114.37	8.00	111.45	7.80
3	Nitrite	182.14	182.32	100	100.10
4	Sulphate	199.78	1.47	199.92	1.47
5	Chloride	130.12	0.96	131.25	0.97
6	Phosphate	26.66	26.66	80	80
TOTAL			**222.00**	**190.49**	

In this study, the water quality index of pond water samples is found in the range of 86.733 (post-monsoon) to 101.105(pre-monsoon) (**table-8**). Water Quality Index of water samples depicted in table 8, which is compared to the standard water quality status. This shows that the water sample belongs to the poor category. Along these lines, it tends to be assigned as not reasonable for domestic or irrigation purposes.

Table 8. WQI during the pre-monsoon and post-monsoon period (WQI=∑qn wn/∑wn) calculated using weighted arithmetic index method

Seasons	Water Quality Index (WQI)
Pre-monsoon	101.11[a]
Post-monsoon	86.73[b]

The statistical analysis of physico-chemical parameters by paired t-test was demonstrated that aside from the estimations for the values of pH and dissolved oxygen, other parameters indicated significant differences. The nitrite, sulphate and chloride content were found significantly higher in the pre monsoon period. The correlation coefficient of various physico-chemical parameters and zooplankton groups shows their dependence with one another. It was concluded statistically by Pearson's correlation coefficient analysis, that the physico-chemical parameters such as pH, Dissolved Oxygen demonstrated significant positive correlation and phosphate indicated significant negative correlation during the pre-monsoon period though Dissolved Oxygen, Nitrite and Sulphate demonstrated significant negative correlation during the post-monsoon period **(Table 9).**

Table 9. Pearson`s correlation coefficient between physico-chemical parameters and various zooplankton groups

Physico-chemical parameters	Zooplankton correlation during pre-monsoon	Zooplankton correlation during post-monsoon
pH	0.998633	0.488719
Dissolved Oxygen	0.888527	-0.88509
Nitrite	0.000148	-0.8661
Sulphate	-0.67574	-0.8661

Chloride	-1	-0.19952
Phosphate	-0.75583	0.755832

Discussions

Phytoplankton composition in Keekozhoor pond: Phytoplankton studies are helpful for the identification of physico-chemical and other biological conditions of the water in any aquatic ecosystem. In the course of the most recent couple of decades, there has been discovered more concern about the processes influencing the development of phytoplankton communities, principally according to physico-chemical factors [14,15]. Phytoplankton are sensitive to the ecological changes and their distribution fluctuates extensively as for seasons, water quality and nutrient concentrations.

Chlorophyceae: In the present study, Chlorophyceae was the dominating group in both the seasons, might be because of high DO, slow water current during this period which are in accordance with the findings of Kaur *et al* [16]. The higher concentration of nitrate, calcium and phosphate in water favour the growth of certain green algae (*Scendesmus*, and *Ankistrodesmus sp*.) and henceforth these species are designated as pollution indicators [17]. The higher occurrence of these previously mentioned species at the pond. means that they can endure elevated levels of pollution.

Bacillariophyceae: Diatoms are used as water quality indicators as some of the diatoms grow and reproduce quickly while the others get disappeared and help to distinguish the changes in water quality [18]. The occurrence of *Navicula*sp, *Nitzschia* and *Synedra ulna* indicate pollution in the water body and are observed during the study period which are in accordance with the finding of Tessy & Sreekumar [19]. Kaur [16] have recorded an abundance of diatoms where the water was profoundly polluted. The peak of diatoms was recorded during pre-monsoon when the temperature was high and DO contents were comparatively lower. This is in conformity with the observations of Thomas & Deviprasad; Laskar & Gupta [20,21]. Many physico-chemical parameters are necessary for the existence

of diatoms. The density of Bacillariophyceae population was found to be closely associated with pH [22]. pH ranges of 7 to 8.25 influence the growth of diatoms, which was evidenced in the present study. Also, there were good supplies of nitrite during the pre-monsoon and have higher growth of diatom indicating the influence of pH and nitrite that favour the growth of diatoms.

Euglenophyceae: Euglenophyceae species were recorded lowest compared with different classes of algae studied. This is concomitant with the findings of Thomas & Deviprasad; Mahor & Singh; Hosmani who recorded members of Euglenoids in least numbers in studied tropical water bodies [20,23,24]. Abundance of Euglenophyceae members in a water body can be attributed to entry of nutrients through the influx of domestic sewage (an indication of organic pollution) [21]. The presence of the most pollution tolerant *Euglena sp* and *Phacus sp*. depicts high organic and sewage contamination. This perception is in concurrence with the findings of several researchers [16,17,25].

Cyanophyceae: Temperature, pH, phosphate etc are some of the central components which control the population of Cyanophycean members. Cyanophycean members are seen as more in the post-monsoon period than in the pre-monsoon. The presence of *Oscillatoria sp*. may propose eutrophication of water.

Xanthophyceae: In the present study, Xanthophyceae was represented by just single genera *Characiopsis* which demonstrated its essence in the pre-monsoon period as it were. They occur often under dystrophic or mesotrophic conditions, showing their diversity in acidic waters enriched with dissolved organic matter [26].

Zooplankton composition in Keekozhoor pond

Protozoa: They were found to remain low in post-monsoon and high in pre- monsoon seasons. The ascent in protozoan population during post-monsoon season could be related to the fact that the monsoon rain downpours bring a lot of organic matter from the catchment areas which have a huge number of bacteria and accordingly go about as a wellspring of nourishment for protozoans.

Cladocera: After attaining minimum value in pre- monsoon, the Cladoceran density recorded a rise in the post-monsoon season which might be because of variations in pH, luxuriant growth of phytoplankton, favourable temperature and availability of abundant food in the form of bacteria, nanoplankton and suspended detritus.

Tardigrade: *Dactylobiotus Schuster* was reported from the pre-monsoon period. The literature on tardigrades is relatively limited. Living in various habitats, tardigrades play major roles as consumers and decomposers in trophic networks of terrestrial and fresh water environments and can endure extreme climatic conditions [27].

Analysis of physico-chemical parameters

pH: For the situation of Keekozhoor pond, the average pH value observed during the investigation time frame was 6.57±0.21 during the pre-monsoon and 6.92±0.09 during the post-monsoon. The norms of pH lower 4.5 and greater than 9.5 as described by RAMP [28] are commonly unsafe to aquatic existence of living beings which demonstrates that the pH of our investigation pond isn't at all perilous to aquatic life. Along these lines, the slight variations in pH worth might be achieved by the downpour during the post-monsoon period. According to Kurbatova [29], the pH extends somewhere in the range of 6.0 and 8.5 shows medium productive nature of a reservoir; more than 8.5 highly productive and under 6.0 low productive nature of a reservoir which demonstrates that our investigation pond has a medium production of plankton population.

Chloride: Temporal patterns of chlorides content in water demonstrated that most extreme chloride content was registered in pre-monsoon (24.08±0.16) contrasted with post- monsoon (15.53±0.24) might be because of high pace of dissipation and organic waste of animal origin. The base estimation of chloride in the post-monsoon period might be because of weakening of pond water by downpour. The findings are in agreement with Khabade *et al*; Verma & Prakash; Mishra *et al*. [30,31,32].

Dissolved Oxygen: Dissolved oxygen is a significant parameter of the wetland which is basic to the metabolism of all aquatic organisms that possess aerobic respiration [33]. It as a rule

mirrors the physical and biological processes prevailing in water. Additionally, DO is an important parameter which increases the favourable condition of algal growth during the investigation time frame. In summer (pre-monsoon) with the increase in water temperature, there was reduction in DO (3.47±0.16), whereas in post-monsoon due to decrease in temperature, the level of DO increased (3.51±0.1). These results were in conformity with Masood & Krishnamurthy and Srivastava *et al.* [34,35].

Sulphate: Low estimations of sulphate have been seen in all the sites during the whole investigation time frame 0.43±0.08 during pre-monsoon and 0.16±0.03 during post-monsoon. There is just a slight difference in sulphate concentration between the two periods which might be because of the rot of leaves or other planktons, affidavit of residential squanders and presence of gypsum rocks. Biological oxidation of reduced sulphur species to sulphate likewise increases its concentration [36]. Downpour water has very high concentration of sulphate especially in the zones with high climatic contamination. Analysing the sulphate concentration in the post-monsoon period, values are seen as comparatively low indicating low atmospheric pollution.

Nitrite: The values of nitrite in the present study ranged from 5.23±0.15 mg/l during the pre-monsoon and 3.13±0.15 mg/l during the post-monsoon period. The maximum value was recorded during the pre-monsoon period which might be because of natural squanders, concentrated domesticated animals activities, surface spill over and sewage release and the minimum value during the post- monsoon are because of high vegetation that bolsters the growth of plankton [37]. The pH estimations of pre monsoon and post monsoon are seen as inversely proportional to the nitrite estimations of similar periods. A comparable outcome was likewise seen by Mayyavan [38].

Phosphate: Phosphate content was less and the greater part of the period it was found underneath the distinguishable level. In the present study, the maximum value was recorded during the pre-monsoon period and least during the post-monsoon. The estimations of phosphate ranged from 0.12±0.02 mg/l during the pre-monsoon because of the high pace of algal growth, aquatic plants growth and rot of vegetation and 0.03±0.01 mg/l during post-

monsoon. The estimation of phosphate brought down in the winter season because of expanded take-up of phosphate for the luxuriant growth of macrophytes [39].

4. Summary

The present investigation generated important baseline data on the pollution status and plankton community structure of Keekozhoor pond. Pollution indices such as Palmer`s index provides useful information about the pollution load in the water bodies. Calculation of pollution indices showed that the water body is highly organic polluted due to the presence of some algal groups. Zooplanktons are sensitive to environmental changes and their dissemination fluctuates extensively concerning seasons, water quality and nutrient concentrations. Analysis and interpretation of the data on zooplankton and water quality parameters gave the fundamental data to survey the impact of anthropogenic impacts on the hydrobiology of the pond. The present study provides an insight into the distribution, abundance, diversity and ecology of planktons in the selected pond. The current examination was embraced to characterize the quality of water samples with special reference to physicochemical properties to decide its WQI. The water quality indices (WQI) were in the range 86.733-101.105, demonstrating poor water quality in the study area. The results demonstrated that the estimations of physico-chemical parameters were responsible for the diverse group of plankton in the pond. High species assorted variety in the site portrays the favourable conditions in terms of physicochemical conditions and food at all the sites. We can conclude that the pond is moving toward eutrophication and is organically polluted. This study can offer the essential data for the authority to secure and monitor these small water bodies. Consequently, the water body must be protected for their expected use, a reasonable and all-encompassing administration arranging is fundamental for conservation of this pond. The present investigation generated important baseline data on the pollution status and plankton community structure of Keekozhoor pond. Pollution indices such as Palmer`s index provides useful information about the pollution load in the water bodies. Calculation of pollution indices showed that the water body is highly organic polluted due to the presence of some algal groups. Zooplanktons are sensitive to environmental changes and their

dissemination fluctuates extensively concerning seasons, water quality and nutrient concentrations. Analysis and interpretation of the data on zooplankton and water quality parameters gave the fundamental data to survey the impact of anthropogenic impacts on the hydrobiology of the pond. The present study provides an insight into the distribution, abundance, diversity and ecology of planktons in the selected pond. The current examination was embraced to characterize the quality of water samples with special reference to physicochemical properties to decide its WQI. The water quality indices (WQI) were in the range 86.733-101.105, demonstrating poor water quality in the study area. The results demonstrated that the estimations of physico-chemical parameters were responsible for the diverse group of plankton in the pond. High species assorted variety in the site portrays the favourable conditions in terms of physicochemical conditions and food at all the sites. We can conclude that the pond is moving toward eutrophication and is organically polluted. This study can offer the essential data for the authority to secure and monitor these small water bodies. Consequently, the water body must be protected for their expected use, a reasonable and all-encompassing administration arranging is fundamental for conservation of this pond.

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