



Effect of physico-chemical parameters on phytoplankton of Kach Amaqzai District Loralai Balochistan

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Abstract

Water play a vital and significant role for life. The Fresh water Phytoplankton diversity and Physico-chemical parameters of Pathan kot have been studied for period of one year from Kech Amakzai River is situated district Loralai Balochistan. The Physico-chemical and plankton diversity was studied from January 2017 to December 2017. The Physico-chemical parameters includes Temperature, water temperature, pH, Turbidity, Total dissolved Solids(TDS), Dissolved Oxygen (DO), biological oxygen demand (BOD), chemical oxygen demand (COD), Silicate, Total Hardness, Alkalinity, sulphate, CO₂. The statistics obtained from the physico-chemical analysis of the water quality in the Killi Kach Amaqzai of district Loralai clearly indicates that most of the important parameters are in the permissible limits of WHO standards. It is evident that the ecological conditions of water reservoir support a rich diversity of algal flora, therefore this river has rich number of species and biodiversity of fresh water Phytoplankton. A total 38 species belonging to four groups were recorded of which 10 species belonged to *Cyanophyceae*, 14 to *Chlorophyceae*, 11 to *Bacillariophyceae*, 3 to *Euglenophyceae*. The present study reveals that each species as well as group appeared to prefer certain months of the year to record their highest counts. Further, in term of count, among the various groups, the order of dominance was *Chlorophyceae* > *Bacillariophyceae* > *Cyanophyceae* > *Euglenophyceae*.

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Introduction

Water play a vital and significant role for life. The. A specific area for storing capacity of water used for cultivation. Globally the distribution of fresh water is only 3% and out of these limit very low quantity 0.01% which is used and helpful for mankind activities (Hinrichsen and Tacio, 2002). Inland ground water consumed for different usage above 90% of urban and rural areas for domestic and commercial purpose (Nabeela *et al.*, 2014). Water have crucial for their mineral abundance for both human as well as aquatic biota (Versari *et al.*, 2002).

Number of physical and chemical parameters like, temperature, conductivity, salinity, pH, hardness, nitrate and phosphate play a vital role in controlling the plankton biomass (Mahboob *et al.*, 1993). Dominancy and richness of phytoplankton in tropical reservoir clearly indicate abundant fish yield zooplankton play a significant role as a secondary producers and they have connecting link between phytoplankton and other feeding level (Baloch *et al.*, 2004). Hence, the present study was observe to estimate the phytoplankton quality and quantity for one year in Pathan Kot River is situated in district Loralai Balochistan.

Material and methods

Physico-chemical parameters

Water bodies for collection of water samples from experimental site monthly for a period of one year. From sample site water sample was collected for various sampling position, normally from the surface and bottom which was 5-10 inches. For analysis of inland water both Physico-chemical parameters was adopted the following Standard Method (Apha, 1995).

The surface and bottom water temperature were measured by using a centigrade mercury thermometer calibrated to 100°C. Some physico-chemical variables like pH, Dissolved Oxygen (DO) Total alkalinity were analyzed on the spot in field, all other variables were analyzed in laboratory. The turbidity of water was measured by using Jakson turbidity unit and using Sacchi disk for water

transparency. Total dissolved solids (TDS) was estimated by using conductivity meter. Dissolved oxygen was estimated by DO Meter. Total alkalinity was estimated using unmodified Winkler's method.

The pH was measured in the field, and later on it will confirm by using digital pH meter. Biological oxygen demand (BOD) was estimated by following procedure was adopted Sawyer and Bradney (1946) and chemical oxygen demand (COD) was use Moore *et al.* (1949). Total Hardness, salicate, sulfate and Free CO₂ were estimated according to Apha (1995).

Phytoplankton analysis

Phytoplankton flora will be collected on monthly basis. The collection of Phytoplankton samples was be done on different localities of water sampling stations. Phytoplankton sampling was be collected from mentioned sampling station from January 2017 to December 2017. For Qualitative analysis of Phytoplankton samples will be collected by using phytoplanktonic net (No. 25 Wisconsin Plankton Net). Water samples was collected 3 Liter in sampling station, 5% formalin with 70% alcohol will used for preservation and the phytoplankton samples will identify in lab Identification of phytoplankton will be done by microscopic method based on morphological and visible criteria. Identification of phytoplankton flora will carried out using key Majeed, (1935) Endmondson, (1992), Shameel (2001).

Results and discussion

The values of Physico-chemical parameters that were estimated during the period of study are presented in Table 1.

The various fresh water phytoplankton that occur in Pathan kot during the period of study presented in Tables 2-4. Phytoplankton were represented by 36 species belonging to four groups was *Chlorophyceae*, *Bacillariophyceae*, *Cyanophyceae* and *Euglenophyceae*. Table 2 recorded the various *Cyanophyceae* species that were recorded during twelve months of study in Kach Amaqzai.

Table 1. Physico-chemical parameters of Killi Kach Amaqzai.

Months	Temp	Water temp	pH	Turbidity JTU	T.D.S Mg/l	DO Mg/l	B.O.D mg/l	C.O.D mg/l	Sal	hard	Alk	Sul	Co2
Mar	30	18	7.2	3.1	245	7.8	4.6	5.6	0.2	39	130	4.7	6.1
Apr	27	22	7.1	2.9	311	7.4	3.8	6.8	0.1	30	142	5.3	9.2
May	34	26	7.5	3.5	299	6.5	2.7	10.3	0.2	23	104	3.9	7.3
Jun	36	23	7.7	4.7	322	6.1	2.4	10.9	0.2	16	95	5.2	6.7
Jul	39	22	7.4	3.2	349	5.6	1.9	8.2	0.3	10	110	6.4	5.4
Aug	31	18	7.1	3.6	380	5.1	3.3	7.8	0.1	25	75	4.8	4.1
Sep	24	15	7.9	2.9	301	4.8	3.7	6.4	0.3	13	90	3.9	3.8
Oct	20	12	7.0	1.9	266	4.6	4.2	5.3	0.2	22	69	2.8	2.9
Nov	16	10	7.3	2.2	250	5.5	4.8	4.7	0.4	27	80	1.9	2.2
Dec	13	7	7.2	2.5	221	6.2	5.3	3.9	0.2	32	88	2.3	1.9
Jan	9	5	7.6	2.9	217	7.9	4.6	3.2	0.3	22	97	3.6	1.7
Feb	7	3	7.5	3.1	211	8.7	5.1	3.3	0.2	26	113	3.1	1.5
Mean	23.83	15.08	7.37	3.04	281	6.35	3.86	6.36	0.22	23.75	99.41	3.99	4.4
S. D	10.77	7.64	0.27	0.71	54.61	1.33	1.10	2.55	0.08	8.13	21.76	1.33	2.52
C.V	45.21	50.68	3.70	23.60	19.43	20.99	28.50	40.08	38.49	34.25	21.88	33.56	57.38

As seem from the table 2 a total of 16 *Chlorophyceae* species that were recorded. Literature reveals that Ghosh *et al.* (1974) reported their maximum occurrence during the moon soon period while Singh (1981) recorded their preference for the summer season. Among the *Chlorophyceae* the most

dominant species in term of number was *Staurastrum* followed by *Coelastrum* while the lowest Number of species in term of number was *Cosmarium* and *Asterococcus* species. To estimate the total *Chlorophyceae* count (Table 2) reveals that there was unimodel peak.

Table 2. Monthly abundance of chlorophyceae of Killi kach Amaqzai.

Species	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mean	SD	CV
<i>Asterococcus</i>	30	26	20	18	34	40	36	22	18	13	10	7	22.83	10.53	46.15
<i>Staurastrum</i>	44	31	27	24	24	21	53	64	72	50	39	30	25	40.00	16.72
<i>Coelastrum</i>	30	42	54	63	63	72	58	80	40	29	26	19	9	43.50	22.05
<i>Ozygnema sp</i>	50	38	33	40	40	36	29	20	18	25	16	13	10	27.33	12.35
<i>Closterium sp</i>	21	17	10	9	9	22	31	12	7	4	14	20	5	14.33	8.09
<i>Ulothrix limnetica</i>	30	25	21	19	19	34	40	50	45	36	29	23	17	30.75	10.51
<i>Pediastrum tetras</i>	24	19	15	12	12	10	8	11	17	22	14	6	9	13.91	5.66
<i>Zygnema mucigenum</i>	27	32	39	53	53	44	29	22	19	17	14	9	11	26.33	13.72
<i>Chlorella vulgaris</i>	40	31	28	23	23	20	18	16	12	11	19	22	31	22.58	8.55
<i>Monoraphidium arcuatum</i>	21	15	18	20	20	19	17	15	10	23	30	32	9	19.08	6.93
<i>Tetrastrum</i>		30	21	17	17	13	10-	7	22	18	9	6	2	4	13.54
<i>Netrium</i>	20	12	14	18	18	23	9	3	7	15	21	27	16	15.41	6.94
<i>Cosmarium</i>	10	15	19	21	21	25	32	15	10	7	11	16	8	15.75	7.47
<i>Chodatella</i>	50	42	36	20	20	28	24	21	18	16	13	10	6	23.66	13.22
<i>Asterococcus</i>	15	10	9	7	5	11	16	19	21	25	14	3	14	3	12.91
<i>Zygnema mucigenum</i>	22	18	16	12	9	8	17	20	28	30	10	14	10	14	17.00

In general there was a decreasing trends from October till November followed by December a gradual increase to reach the peak in March. Literature reveals that *Chlorophyceae* preferred

different periods in different water bodies. Thus finding of Kohli (1981) that they preferred January and February in a reservoir while Singh (1990) suggested their preference in February for pond and

Sivakami (1996) between October and February for pond in Tamil Nadu. In the present study, the most preferred season was between June and July. Zafar (1964) reported high pH values favoring their growth. In the present study also, the *Chlorophycean* count

showed a positive correlation between dissolved oxygen and pH (r value = 0.12). Jayanthi (1994) reported that *Chlorophyceae* form an important source of food for fishes and hence play an important role in aquaculture.

Table 3. Monthly occurrence of bacillariophyceae of Kach Amaqzai.

Species	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mean	SD	CV
<i>Cymbella obtusififormes</i>	20	15	10	9	5	8	22	25	13	6	2	4	11.58	7.50	64.75
<i>Navicula cryptocephala</i>	19	15	10	6	2	7	11	16	22	17	12	8	12.08	5.88	48.70
<i>Merismopedia elegans</i>	10	7	9	3	5	0	1	15	17	20	6	5	8.16	6.32	77.41
<i>Tabellaria</i>	12	17	21	14	10	9	3	7	1	6	11	4	9.58	5.88	61.40
<i>Cocconeis</i>	15	20	17	18	13	10	9	3	8	1	7	3	10.33	6.31	61.11
<i>Synedra</i>	20	11	15	19	9	4	7	1	2	5	6	9	9.00	6.23	69.30
<i>Nitzschia</i>	9	8	2	6	11	15	20	13	8	4	1	6	8.58	5.50	64.09
<i>Cymbella</i>	19	22	17	14	10	9	7	1	5	11	6	8	10.75	6.18	57.49
<i>Mallomonas</i>	23	18	21	15	10	9	11	17	22	26	30	12	17.83	6.72	37.71
<i>Stephanodiscus</i>	9	11	15	21	32	16	19	10	8	2	5	7	12.91	8.25	63.88
<i>Fragilaria</i>	31	44	52	29	25	20	16	9	18	7	1	6	21.50	15.57	72.42
<i>Diatoma vulgare</i>	20	13	10	22	28	19	16	12	10	9	2	5	13.83	7.45	53.90

The *Bacillariophyceae* that were recorded in Kach Amaqzai in Table 3. A total of 12 species were recorded out of which the genera *Cymbella affinis* were recorded 3 and 1 species were perennial (*Navicola*) and the remaining were represented by

single species belonging to different genera such as, *Cymbella affinis*, *merismopedia*, *Tabellaria*, *Cocconeis*, *Synedra*, *Nitzschia*, *Cymbella*, *Mallomonas*, *Stephanodiscus*, *Fragilaria*, *Diatoma Vulgare*.

Table 4. Monthly abundance of cyanophyceae in Killi Kach Amaqzai.

Species	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mean	SD	CV
<i>Anabaena spiroides</i>	34	44	31	25	21	18	27	20	15	10	8	4	21.41	11.07	51.73
<i>Microcystis aeruginosa</i>	65	50	48	40	38	30	28	20	18	14	10	8	30.75	17.06	55.49
<i>Gloeocystis ampla</i>	32	26	40	37	56	62	25	20	17	22	29	16	31.83	14.09	44.27
<i>Oscillatoria amoena</i>	20	31	38	42	25	30	27	24	20	18	29	11	26.25	8.24	31.41
<i>Dactylococcopsis</i>	33	24	20	18	15	10	22	27	34	16	8	13	20	8.02	40.10
<i>Phormidium calcicola</i>	40	32	25	22	20	16	19	34	19	16	12	9	22	8.85	40.23

A perennial specie *Navicola* reveals that preferred November to December to up to March their highest counts. Among *Bacillariophyceae*, the most dominant species in term of counts was *Fragilaria* followed by *Mallomonas* while the lowest species dominant species was *Nitzschia*. Different author observed their findings about *Bacillariophyceae* in different months and different water bodies. Sivakami (1996) reported their preference during the months from February to May, Sukumaran (1989) and Singh (1990) reported

their preference between January and September while Hegde and Bharathi (1985) and Ganai *et al.* (2010) reported their preference during the winter season. Thus, the present study is in line with the observations made by Kastooribai (1991), Jayanthi (1994) and Sivakami (1996). Table 4 recorded the various *cyanophycean* species that were recorded during the one year of study in Kach Amaqzai. A total 6 *cyanophycean* species were recorded, single species belonging to different genera such as *Anabaena*

spiroides, *Dactylococcopsis*, *Gloeocystis ampla*, *Microcystis aeruginosa*, *oscillatoria ameona*, *Phormidium calcicola*. The maximum number of species in terms of numbers were recorded *Microcystis aeruginosa* while the least dominant species in numbers was recorded *Dactylococcopsis*. Literature reveals that Ghosh *et al.* (1974) reported their maximum occurrence during the monsoon

period while Singh (1981) recorded their preference for the summer season. Literature reveals that Ganapati *et al.* (1953) reported maximal amount of *Cyanophyceae* to occur when temperature, pH, were high. Prasad and Jonna (1994) point out that *Cyanophytes* to play a significant role in fish production. Among various *Euglenophyceae* that were recorded in the Kach Amazai in Table 5.

Table 5. Monthly occurrence of euglenophyceae of Kach Amazai.

Species	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mean	SD	CV
<i>Lepocincilis ovum</i>	95	80	50	22	20	17	14	12	10	9	6	2	28.08	30.44	108.40
<i>Phacus Pleuronectes</i>	84	60	32	26	22	19	16	13	10	8	3	6	24.91	24.09	96.69
<i>Phacus nordstedtii</i>	250	195	160	102	85	72	61	52	37	26	20	15	89.58	74.91	83.62

As our results reflect that, *Euglenophyceae* were represented by 3 species belonging from two genera *Phacus Pleuronectes*, *Phacus nordstedtii* and single species of *Lepocincilis ovum* preferred March to May records its highest counts. Among these 3 species *Phacus nordstedtii* was most dominant species while the lowest number of species in number was *Phacus pleuronectes* in terms of count. In the present study the literature reveals wide range of Euglenophyceae

species occur in maximum number in various water bodies of India. Singh (1981) reported its preference in summer, Sukumaran (1989) noticed their preference in October, June, September and December and Kastooribai (1991) in September to October. However, Sivakami (1996) reported their preference in March and August. Thus, the present study is in agreement with the observation made by Sivakami (1996).

Table 6. Phytoplankton total count of Killi Kach Amazai.

Species	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
<i>Chlorophyceae</i>	464	394	380	372	412	414	420	354	331	320	263	184
<i>Bacillariophyceae</i>	197	201	199	176	160	126	142	129	134	114	89	77
<i>Cynophyceae</i>	224	207	202	184	175	168	148	145	123	96	96	61
<i>Euglenophyceae</i>	429	335	242	150	127	108	91	77	57	43	29	23

Conclusion

The Kach Amazai water bodies have significant role in drinking, Agriculture and irrigation. The Statistics obtained from the Physico-chemical analysis of the water quality in the Kach Amazai most of the important parameters of the said water clearly indicate that the water bodies are in the permissible limits of WHO standards. However, the finding of the study revealed a clear seasonal pattern of the changes in phytoplankton communities in the Kach Amazai

water bodies.

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