International Journal of Research in Agriculture and Forestry
Volume 1, Issue 1, November 2014, PP 21-26
ISSN 2394-5907 (Print) & ISSN 2394-5915 (Online)

Limnological Assessment of Some Selected Raceways Rectangular Tanks at UVAS Lahore (Ravi Campus Pattoki) Pakistan

Karim Johar Khan[1, 2], Noor Khan[1], Fayyaz Rasool[1], Sana Ullah[2,*]

[1]Department of Fisheries and Aquaculture, University of Veterinary and Animal Sciences, Lahore, Ravi Campus, Pattoki Pakistan
[2]Fisheries and Aquaculture Lab, Department of Animal Science Quaid-i-Azam University Islamabad, Pakistan.
**sunyuop@gmail.com*

Abstract: *The present study was carried out to assess water quality of selected raceways rectangular tanks by evaluating some of its limnological parameters at Department of Fisheries and Aquaculture, University of Veterinary and Animal Sciences (UVAS) Lahore, Ravi Campus Pattoki Pakistan. The parameters studied were temperature, pH, dissolved oxygen, total dissolved solids and electrical conductivity, as these are important from fisheries point of view. The results for these factors were falling within the United States Public Health Standards (USPHS) suggested permissible limits for aquatic organisms. To maintain and conserve water quality at UVAS, it is suggested to assess its water quality on regular basis.*

Keywords: *Pattoki, Raceways, Water, Limnology, Permissible limits, Correlation.*

1. INTRODUCTION

The essentiality and requirement of water for human life cannot be denied [1]. Water quality conservation and management is one of the key interests of human beings as they readily depend on it for almost all of their life activities [2]. Both plants and animals especially aquatic ones require water that is free of chemicals and microbial contaminants and moderately pure [3]. Toxic chemicals addition to these water bodies can make their survival difficult [4] and even severe load of these pollutants can kill all forms of aquatic life [5, 6].

Water quality is evaluated by making comparison of its limnological parameters against suggested permissible limits [7]. A lot of research is being going on in different parts of Pakistan and all around the world regarding water quality. Water pollution and threat to aquatic biodiversity is making water quality research as one of the most critical and debatable work of today's science.

Keeping in view the importance of water quality analysis present study was conducted in order to assess the water quality of different raceways rectangular tanks at University of Veterinary and Animal Sciences (UVAS) Lahore, Ravi Campus Pattoki Pakistan. Its water was assessed by studying its different limnological parameters. The studied factors are temperature, pH, dissolved Oxygen, electrical conductivity and total dissolved solids. These parameters were considered and evaluated because these affect all aspects of fish's life.

2. MATERIALS AND METHODS

2.1. Location

The study was conducted at Research and Training Facilities, Department of Fisheries and Aquaculture, University of Veterinary and Animal Sciences, Lahore (Ravi Campus at Pattoki) Pakistan.

2.2. Water Sampling and Analysis

The methodology of Ullah et al. [8] was adopted for water sampling and analysis. Correlation for the studied parameters was calculated using Microsoft Excel 2010.

3. RESULTS AND DISCUSSION

The results of our study showed that all the studied parameters were falling in the standard permissible limits suggested by USPHS [9] for surface water. These are categorized in sub headings in the following.

3.1. Temperature

Temperature is considered as one of the important factor for the growth of phytoplankton, zooplankton and fish. The data obtained for the water temperature of four raceway tanks during the experimental period is given in Table 1. Water temperature varied from 24^0C to 30°C. The highest value of water temperature in all four tanks was observed on 19^{th} of May which was 30°C. Lowest value of water temperature in all the four tanks was observed on the March, 31^{st}, which was 24°C.

Table 1. *Weekly Observations of Water Temperature (°C) in four Raceway Tanks*

Weeks	Time duration	T_1	T_2	T_3	T_4
1	26-03-13	25.01	25.24	25.04	24.64
2	08/04/13	25.94	25.74	25.19	25.14
3	15/04/13	26.11	25.52	25.35	26.78
4	22/04/13	25.28	25.23	26.04	26.45
5	29/04/13	26.08	25.76	25.66	25.46
6	06/05/13	27.37	26.04	26.34	25.94
7	13/05/13	28.86	28.68	28.86	28.31
8	20/05/13	30.35	30.14	30.35	29.37
	Mean	26.88	25.54	26.54	26.51

3.2. Dissolved Oxygen

It is an important attribute for the survival of fishes. It needs to maintain at or near saturation in all culture systems in which aquatic life is being reared. The data obtained for the dissolve oxygen of four raceway tanks during the experimental period is given in Table 2.It varied from 3.5mg/l to4.5mg/l. The highest value of dissolved oxygen in all four tanks was observed on 15th of May which was 4.49°C. Lowest value of dissolved oxygen in all the four tanks was observed on the April, 17th, which was 3.4°C.

Table 2. *Weekly observation of Dissolved oxygen in four Raceway Tanks*

Weeks	Time duration	T_1	T_2	T_3	T_4
1	26-03-13	3.57	3.59	3.95	3.35
2	08/04/13	3.95	3.89	3.72	3.73
3	15/04/13	4.02	3.70	3.59	4.06
4	22/04/13	3.56	3.73	3.98	4.05
5	29/04/13	4.35	4.04	4.13	4.17
6	06/05/13	4.43	4.33	4.35	4.15
7	13/05/13	4.37	4.43	4.42	4.20
8	20/05/13	4.31	4.46	4.01	4.23
	Mean	4.07	4.02	4.07	4.01

3.3. pH

The extent to which water is acidic or alkaline is called the pH of the water. It is an important parameter for the growth of fishes in a near range. The data obtained for the pH of four raceway tanks during the experimental period is given in Table 3.It varied from7.6 to 7.8 on reading. The highest value of pH in all four tanks was observed on 30th of April which was 7.8. Lowest value of pH in all the four tanks was observed on the April 1st, which was 7.6.

Table 3. *Weekly observation of pH in four Raceway Tanks*

Weeks	Time duration	T_1	T_2	T_3	T_4
1	26-03-13	7.69	7.69	7.73	7.67
2	08/04/13	7.73	7.73	7.64	7.71
3	15/04/13	7.73	7.7	7.67	7.73
4	22/04/13	7.67	7.69	7.73	7.72
5	29/04/13	7.73	7.71	7.72	7.67
6	06/05/13	7.74	7.71	7.71	7.75
7	13/05/13	7.67	7.7	7.7	7.72
8	20/05/13	7.74	7.71	7.72	7.7
	Mean	7.71	7.7	7.7	7.71

3.4. Total Dissolved Solids

Common suspended solids in water are silt, mud, mud, metals and ions. They can limit light penetration in the water. It should be kept at range for the growth of fishes. The data obtained for the TDS of four raceway tanks during the experimental period is given in Table 4. It varied from 214mg/l to 240mg/l on reading. The highest value of pH in all four tanks was observed on 16th of April which was 268mg/l. lowest value of pH in all the four tanks was observed on the March 31st, which was 212mg/L.

Table 4. *Weekly observation of Total dissolved solids in four Raceway Tanks*

Weeks	Time duration	T_1	T_2	T_3	T_4
1	26-03-13	228.21	216.1	221.5	216.79
2	08/04/13	221.5	223.93	225.1	224.43
3	15/04/13	224.86	215.86	223.57	224.5
4	22/04/13	221.71	220.86	223	223.71
5	29/04/13	224	220.71	227.29	225.93
6	06/05/13	225	216.64	221.71	224.43
7	13/05/13	221.5	218.43	221.43	215.5
8	20/05/13	217.42	224	222.5	223.83
	Mean	221.79	219.6	223.28	223.76

3.5. Electrical Conductivity

The electrical conductivity of water estimates the total amount of solids dissolved in water TDS. The electrical conductivity of the water depends on the water temperature: the higher the temperature, the higher the electrical conductivity would be. The data obtained for the EC of four raceway tanks during the experimental period is given in Table 5. It varied from 0.4-0.5microsiemens on reading. The highest value of pH in all four tanks was observed on 3rd of April which was 0.5. Lowest value of pH in all the four tanks was observed on the March 31st, which was 0.4.

Table 5. *Weekly Observation of Electrical Conductivity in four Raceway Tanks*

Weeks	Time Duration	T_1	T_2	T_3	T_4
1	26-03-13	0.44	0.46	0.43	0.48
2	08/04/13	0.42	0.41	0.44	0.45
3	15/04/13	0.4	0.46	0.46	0.4
4	22/04/13	0.47	0.43	0.41	0.4
5	29/04/13	0.46	0.44	0.42	0.46
6	06/05/13	0.4	0.44	0.44	0.45
7	13/05/13	0.41	0.46	0.45	0.4
8	20/05/13	0.47	0.41	0.43	0.4
	Mean	0.43	0.45	0.43	0.43

3.6. Correlation Coefficient for the Studied Parameters

In the present trial of 54-days the limnological parameters of the raceway cemented tanks showed varying correlation responses. Correlation coefficient for Tank 1 is given in Table 6. DO showed positive and significant correlation with pH and correlation TDS and temperature was also positive but non-significant and highly significant, respectively, while correlation with EC was negative and highly significant. The correlation of pH with TDS was positive and non-significant and with TEM and EC was positive and negative respectively and was significant and highly non-significant. The correlation of TDS with TEM was positive and significant while with EC was negative and highly significant and the correlation of TEM with EC was positive and highly significant.

Table 6. *Correlation Matrix among the Limnological Parameters of T1*

	DO	pH	TDS	Temp
pH	0.33944 0.0112			
TDS	0.22891 0.0928	0.06077 0.6594		
Temp	0.72330 <.0001	0.17085 0.2123	0.12088 0.3793	
EC	-0.34571 0.0097	-0.28502 0.0349	-0.25346 0.0619	-0.18215 0.1832

Correlation coefficient for Tank 2 is given in Table 7. In Tank 2 DO showed positive and non-significant correlation with pH and correlation TDS was negative and highly significant and for temperature was positive and highly significant while correlation with EC was positive and significant. The correlation of pH with TDS was negative and with Temperature was positive respectively while the P values of these are highly significant and significant while correlation with EC was positive and non-significant. The correlation of TDS with Temp and EC was negative and both highly-significant values. The correlation of Temp with EC was positive and non-significant.

Table 7. *Correlation Matrix among the Limnological Parameters of T2*

	DO	pH	TDS	Temp
pH	0.23428 0.0851			
TDS	-0.47105 0.0003	-0.41461 0.0016		
Temp	0.58820 <.0001	0.20156 0.1400	-0.66420 <.0001	
EC	0.31846 0.0178	0.10761 0.4342	-0.38445 0.0038	0.24282 0.0741

Correlation coefficient for Tank 3 is given in Table 8. Correlation of DO with pH was positive and highly significant and with TDS and Temp was positive and significant and highly significant respectively and relation with EC was negative and significant. The relation of pH with TDS and Temp was positive and non-significant respectively and with that of EC was negative highly significant. The correlation of TDS with Temp and EC was positive and negative respectively and significant and non-significant. The correlation of temp with EC was positive and non-significant**.**

Table 8. *Correlation Matrix among the Limnological Parameters of T3*

	DO	pH	TDS	Temp
pH	0.36664 0.0059			
TDS	0.27967 0.0386	0.20234 0.1385		
Temp	0.73072 <.0001	0.19754 0.1483	0.31443 0.0194	
EC	-0.26802 0.0479	-0.41675 0.0016	-0.24994 0.0657	0.05660 0.6815

Correlation coefficient for Tank 4 is given in Table 9. Correlation of DO with pH was positive and non- significant and with TDS and Temp was positive and significant and highly significant respectively and relation with EC was negative and significant. The relation of pH with TDS and Temp was negative and positive while P value was non-significant respectively and with that of EC was negative and also non-significant. The correlation of TDS with Temp and EC was positive and negative respectively and non-significant and highly significant. The correlation of Temp with EC was positive and non-significant**.**

Table 9. *Correlation Matrix among the Limnological Parameters of T4*

	DO	pH	TDS	Temp
Ph	0.10375 0.4510			
TDS	0.27361 0.0432	-0.21195 0.1203		
Temp	0.68089 <.0001	0.12342 0.3693	0.06815 0.6210	
EC	-0.27684 0.0407	-0.23465 0.0846	-0.43041 0.0010	-0.05738 0.6773

The limnological parameters of the raceway cemented tanks showed an overall correlation as; DO showed a positive and significant correlation with pH and correlation TDS and temperature was also positive but non-significant and highly significant, respectively, while correlation with EC was negative and highly significant.

The correlation of pH with TDS was positive and non-significant and with Temperature and EC was positive and negative respectively and was significant and highly non-significant. The correlation of TDS with Temperature was positive and significant while with EC was negative and highly significant and the correlation of Temperature with EC was positive and highly significant. In T_2 fed with rice polish showed that DO show positive and non-significant correlation with pH and correlation TDS was negative and highly significant and for temperature was positive and highly significant while correlation with EC was positive and significant.

The correlation of pH with TDS was negative and with Temperature was positive respectively while the P values of these are highly significant and significant while correlation with EC was positive and non-significant. The correlation of TDS with Temp and EC was negative and both highly-significant values. The correlation of Temp with EC was positive and non-significant. In the tank T_3 correlation of DO with pH was positive and highly significant and with TDS and Temp was positive and significant and highly significant respectively and relation with EC was negative and significant. The relation of pH with TDS and Temp was positive and non-significant respectively and with that of EC was negative highly significant.

The correlation of TDS with Temp and EC was positive and negative respectively and significant and non-significant. The correlation of temp with EC was positive and non-significant**.** In T_4 correlation of DO with pH was positive and non- significant and with TDS and Temp was positive and significant and highly significant respectively and relation with EC was negative and significant. The relation of pH with TDS and Temp was negative and positive while P value was non-significant respectively and with that of EC was negative and also non-significant.

4. Conclusion and Recommendations

The results showed that the studied parameters were falling within the suggested permissible limits and can be used for culturing fish fauna. To protect the water quality, all polluting anthropogenic activities should be controlled. Water quality should be assessed regularly.

Acknowledgment

The authors thank Department of Fisheries and Aquaculture, University of Veterinary and Animal Sciences, Lahore, Ravi Campus, Pattoki- Pakistan for providing Research Facilities.

Disclosure

None of the authors has any conflict of interest.

References

[1] Ullah, S., Ullah, N. and Ahmad, T., 2014, Assessment of Dug Wells' Water for Drinking and Irrigation Purposes at District Dir Lower, Khyber Pakhtunkhwa Pakistan. American Journal of Life Science Researches. Accepted for Publication in Issue publishing in October 2014.

[2] Ullah, S., Ullah, N., Rahman, K. and Ahmad, T., 2014, Study on Physico-Chemical Characterization of Konhaye Stream District Dir Lower Khyber Pakhtunkhwa Pakistan. World Journal of Fish and Marine Sciences. Accepted for Publication in October 2014 issue.

[3] Heydari, M.M. and Bidgoli, H.N., 2012, Chemical Analysis of Drinking Water of Kashan District, Central Iran. World Applied Sciences Journal, 16(6), 799-805.

[4] Sabae, S.Z., El-Sheekh, M.M., Khalil, M.A., Elshouny, W.A.E. and Badr, H.M., 2014, Seasonal and Regional Variation of Physicochemical and Bacteriological Parameters of Surface Water in El-Bahr El-Pherony, Menoufia, Egypt. World Journal of Fish and Marine Sciences, 6(4), 328-335.

[5] Sarwar, S., Ahmad, F. and Khan, J., 2007, Assessment of the quality of Jehlum river water for irrigation and drinking at district Muzaffarabad Azad Kashmir. Sarhad Journal of Agriculture, 23(4), 1041-1046.

[6] Abedi, Z., Hasantabar, F., Khalesi, M.K. and Babaei, S., 2013, Enzymatic Activities in Common Carp; Cyprinus carpio Influenced by Sublethal Concentrations of Cadmium, Lead, Chromium. World Journal of Fish and Marine Sciences, 5(2), 144-151.

[7] Ullah, S., Akmal, M., Aziz, F., Ullah, S. and Khan, K.J., 2014, Hand Pumps' Water Quality Analysis for Drinking and Irrigation Purposes at District Dir Lower, Khyber Pakhtunkhwa Pakistan. European Academic Research, 2(1), 1560-1572.

[8] Ullah, S., Javed, M.V., Rasheed, S.B., Jamal, Q., Aziz, F. and Ullah, S., 2014, Assessment of groundwater quality of district Dir Lower Pakistan., International Journal of Biosciences, 4(8), 248-255.

[9] USPHS., 1962, Public Health Service Drinking Water Standards. U.S Department of Health, Education and Welfare Washington 25, DC.

AUTHOR'S BIOGRAPHY

Sana Ullah got Master of Science in Zoology and Post Graduate Diploma in Geographic Information System and Remote Sensing from University of Peshawar Khyber Pakhtunkhwa Pakistan. Currently he is an M. Phil research scholar at Fisheries and Aquaculture Laboratory, Department of Animal Sciences, Faculty of Biological Sciences, Quaid-i-Azam University Islamabad Pakistan.