

Analysis of Physicochemical Parameters and heavy metals of Water and Sediments with respect fishes Collected from Ghol Dam District Karak, Khyberpakhtunkhwa, Pakistan.

Tahir Azeem¹, Hameed Ur Rehman², Kinza Zarin³,

¹Department of Zoology, Kohat University of Science and Technology-26000, KPK, Pakistan.

²Department of Chemistry, Kohat University of Science and Technology-26000, KPK, Pakistan.

³Department of Environmental Science Northern University Nowshera Cantt, Pakistan

Abstract: A study was indicated to observe some physiochemical properties of water and soil collected from Ghol dam of Bahadar Khel at district Karak, Khyber Pakhtunkhwa province of Pakistan during the period from April 2016 to May 2016. The water and soil parameters like Temperature, Elasticity, Color, Odor, Taste, pH, total dissolve solids (TDS) and conductivity were resolute in the present study. Soil make available all the vital nutrients by means of water, hence, our current study would be cooperative to comprehend the eminence of soil and water in a Ghol dam and its influence on all water biota create in Ghol dam of District Karak KPK Pakistan and results of study parameters on fish development. This study was also conducted for determination of the concentration of some heavy metals (Fe, Ni, Cu, Cr, Ca, Pb and Zn) in water and soil samples of Ghol dam in the area of Bahadar Khel, Karak, KPK, Pakistan. Water and soil samples collected from (Ghol dam) were analyzed by inductively coupled plasma spectroscopy (ICP). The results obtained showed that the average value of Fe and Ca in both water and soil samples were found to be higher than other metals. Heavy metals analyzed in water and soil samples of Ghol dam indicated that among the seven heavy metals tested, Fe was maximum in concentration, in both of the sample. The sequence of heavy metals in water was Ca>Fe>Zn>Cu>Ni>BP=Cr and in Soil were Fe>Ca> Cu>Zn>BP>Ni=Cr respectively. Water temperature of Ghol dam is measured as minimum temperature is 37°C and maximum 39°C the average temperature of dam recorded are 38°C. The average pH of water samples of the dam is 7.49 which are within the range of good quality, total dissolved solids (TDS) of Ghol dam are 75mg/100ml. The content of the electrical conductivity in the water is 600µs /cm. The average pH of soil sample is pH 8.09. The electrical conductivity of Ghol dam soil is 445µs /cm. Total Dissolved Solids of soil sample with an average value 143mg/100ml. It were also concluded that water of this lake is suitable for fish breeding. Hence, our study would provide useful information to fish culturists and fisheries managers for promoting the fish culturing in the local area to raise the economic and social benefits for the local population of Karak district.

Key words - PH metery, Conductivmetry, temperature, Total solids, Total dissolved solids, water, soil, ghol dam

Introduction

Bahadur Khel is a village and Union Council of Karak District in Khyber Pakhtunkhwa province of Pakistan. It is located at 33°10'57N 70°57'15E with an altitude of 548 meters (1801 feet), the village is the site of an extensive rock salt quarry. Bahader Khel is union council which is 7 big villages: Bahader Khel, Darish Khel, Ghol Banda, Anar Banda, Shaheedan Banda, Charparabanda, Shaheedan. Village Bahadurkhel is the origin for these little villages. These villages are known on the name of bahadur khel. For evaluating the fish fauna, a lot of work has been carried out in various aquatic systems throughout Pakistan. Although updated information is available regarding Ichthyofauna of most of the water bodies in Pakistan yet literature did not witness any data regarding fish fauna of Ghol dam district Karak. Therefore the present study was conducted to know about the fish diversity of the Ghol dam. Karak, a drinking water scarcity zone, is located some 140 km from Peshawar on the main Indus Highway between Peshawar and Karachi. It is located at 33°7'12 North latitude 71°5'41 East latitude. Karak is the most literate district in Pakistan Besides its education it is also enriched city of plenty deposits of oil, gas, uranium and salt in country and play important role in the country economy. Between 1940 and 1982 it was part of District Kohat, but on July 1, 1982, it has been upgraded is an independent district. The topography of Karak consists of ranges of broken hills, and this district lies some 600-1400 meter above sea level. Karak is the district of Khyber Pakhtunkhwa province of Pakistan. It is situated to the south of Kohat production potential because several chemical and District and on the north side of Bannu and Lakki physical

factors of water and soil can influence on Marwat districts. Many small dams had been built in productivity, abundance and species composition of all Karak district to store the rain water and also use for aquatic biota [4-5]. Though, there are many domestic and agriculture purposes. Zebi Dam is located physicochemical features of water and soil that may on North East of Karak city. While Changoz Dam was directly or indirectly influence on the quality, production, constructed in 2007 on Changhoz River at 6 Kilometers distribution and growth of fishes and various other west of Karak city in Karak District of Khyber aquatic organisms, however, the parameters like Pakhtunkhwa province of Pakistan [1]. Dams are the most important water source and also as multi usage components, because they could be used as sources of drinking water, energy production as well as for irrigation and fisheries purposes (2). The quality of water and protected soil of an ecosystem can be estimated by studying their large number of physiochemical characteristics that could play a significant role to support all necessities of aquatic biota (3). Therefore, the study of physiochemical parameters of any ecosystem could also be used to analyze the production potential because several chemical and physical factors of water and soil can influence on productivity, abundance and species composition of all aquatic biota (3, 4). Though, there are many physicochemical features of water and soil that may directly or indirectly influence on the quality, production, distribution and growth of fishes and various other aquatic organisms, however, the parameters like temperature, pH and salinity found to be having great impact on the activities of organisms, especially fishes of any lentic and lotic environments [6]. The study of physiochemical characters of water and soil is important for understanding the metabolic events in an environment. The water and soil parameters can influence each other and also on the sediment parameters, as well as they govern the abundance and distribution of both flora and fauna. Therefore, it is obligatory to analyze the important water and soil parameters. Such studies from time to time will provide useful knowledge about all favorable or unfavorable changes that are occurring in an ecosystem and also their impact on all those organisms, which are living in that ecosystem [7]. The present Study was conducted in Ghol dam at Bahadar khel. Bahadur Khel is a village and Union Council of Karak District in Khyber Pakhtunkhwa province of Pakistan. It is located at 33°10'57N 70°57'15E with an altitude of 548 meters (1801 feet), the village is the site of an extensive rock salt quarry. Bahader Khel is union council which is 7 big villages: Bahader Khel, Darish Khel, Ghol Banda, Anar Banda, Shaheedan Banda, Charparabanda, Shaheedan. Village Bahadurkhel is the origin for these little villages. These villages are known on the name of bahadur khel. For evaluating the fish fauna, a lot of work has been carried out in various aquatic systems throughout Pakistan. Although updated information is available regarding Ichthyofauna of most of the water bodies in Pakistan yet literature did not witness any data regarding fish fauna of Ghol dam district Karak.

Therefore the present study was conducted for assessing the quality of water and soil of Ghol dam for proper growth and easy survival of fishes by means of some selected physiochemical properties. The present study will provide useful information for monitoring the changes in the water and soil quality as a result of the dam's natural dynamics over time.

Material and Method

Collection of samples

Soil and water Samples Collection: Soil and water samples were collected from Ghol dam and then the soils were separately mixed to get a composite sample of 2.0 kg. It was then put in tight polyethylene bags and shifted to the laboratory. In the laboratory, samples were oven dried at 60 °C, broken into smaller size particles with mortar and pestle and sieved through a 2.0 mm sieve. Conductivity and Total Dissolve Solids (TDS) of Soil:

Soil and water sample was analyzed by Conductivity meter JENWAY model no.4520. Conductivity meter calibrated by 0.1 KCl (potassium chloride) solutions and washed electrode of conductivity meter with distal water and dried. Now electrode dipped in soil and water of shnebaye stream solution and checked conductivity of soil and water solution and also checked TDS of soil and water solution.

Soil and Water pH:

pH meter JENWAY model no.3505 calibrated with Buffer solution of 4 and 10 pH. Now pH meter electrodes were washed with distal water dried and dipped pH electrode in soil and water sample.

Water samples were collected and stored in plastic bottles and acidified with highly pure analytical grade conc. HNO₃ at pH Sediment samples were stored in zip lock plastic bags and kept in icebox for transportation (8).

0.5g sediment sample was taken in digestion tube. 4 mL highly pure analytical grade conc. HNO₃ was added, sample was heated for 1hr at 120°C and 4mL H₂O₂ was added and digested until it was colorless (9).

Sample treatment

Soil samples were oven dried at 110C. 2gram of each sample was acid digested using nitric acid. Samples were kept on hot plate. After removing from hot plate sample was filtered in 100 ml graduated cylinder up to 35 ml so that 35 ml of each sample was prepared. Water samples were directly subjected to analysis. Hardness of water samples was analyzed using flame photometer. Conductivity of water and soil samples was measured using conductivity meter while pH of water and soil samples was measured using pH meter.

Sample analysis

Samples of plants, soil and water were subjected to atomic absorption spectrometer (Perkin Elmer) for being analyzed for metals like Cd , Cr, Zn, Ni, Fe, Cu and Pb. The instrument setting and operational conditions were done in accordance with the manufacturers' specifications.

Result and discussion

The Present study was conducted on the water and soil collected from Ghol dam in order to analyze them for physicochemical parameters and heavy metals concentration their results are presented in Table 1 and Table 2 respectively.

Table 1. Physicochemical study of water and soil of Ghole Dam district Karak.

Sample	Ph	Conductivity	Color	odor	Taste	Tds	Temperature	Elasticity
Water	7.49	600us/cm	Colorless	odorless	Semi sour	75mg/100ml	38C	Non elastic
Soil	8.09	445us/cm	Blackish	odorless	Tasteless	143mg/100ml	38C	Elastic

Table 2. Heavy Metals concentration in water and soil of Ghol dam district Karak Pakistan.

Heavy Metals	Water	Soil	Permissible limit by WHO/USEPA
Ca	4.801	4.081	0.80
Fe	3.81	6.014	1.00
Zn	1.9452	1.001	0.05
Cu	0.6968	1.001	1.00
Ni	0	0.003	0.01
Pb	0	0	0.2
Cr	0	0	0.02

Although colour of water varies place to place, these colors lay down whether the water is suitable for the growth and survival of organisms beneath it or not, for example greenish and light greenish colored water is suitable for survival, while dark green and brown colored water is deadly for growth and survival [10, 11]. The water and soil of Ghol dam were odorless. The optimum range of conductivity varies from 15- 500 μ s/ml [12]. Current research showed that the EC value of water and soil of Ghol dam was 600 μ s/cm and 445 μ s/cm respectively. The optimum pH of water, supporting the growth varies from 6.5-9.5 and 6.5 to 8.4 correspondingly [13, 14]. From recorded data it has been shown that the pH value of water and soil of Ghol dam district Karak was 7.49 and 8.09 correspondingly. As pronounced temperature greatly affect the ecosystem. Life either directly or indirectly depends on the temperature of water. The crucial temperature ranges from 26- 32 °C [15]. The temperature beyond this range might increase the growth of microorganism which definitely increases the chance of hazardous effect upon life. From present research it can be concluded that the temperature is not suitable for the growth. The temperature of water and soil is given in table 1, which are 38c of both soil and water of Ghol dam. The permitted limits of TDS in water are shown in (Table 1). All values lies within permissible limits suggested by WHO (i.e. 500-1000mg/l) [16]. It is safe for drinking purpose and other domestic and commercial uses. Present research showed that the recorded value of TDS of water and soil of Ghol dam was 75mg, 143mg per 100ml. The taste of water and soil was tasteless and the elasticity of soil and water of Ghol dam are elastic.

Heavy metal concentrations in water and Soil of Ghol dam are illustrated in table (2). Heavy metal concentration in water was found in the order: Ca>Fe>Zn>Cu>Ni>Pb=Cr. The maximum values of heavy metals (Ca, Fe, Zn and Cu) were recorded at Ghol dam in water Sample while Ni, Pb and Cr were not detected in Water samples of Ghol dam. These levels are much higher than the permissible value [17]. This may be attributed due to huge amount of agriculture and industrial waste water discharged into the dams. The high value of metals in water can be attributed to agriculture and industrial discharge of waste material [18]. The higher levels of Pb in water samples of all the dams may be attributed due to combustion of petrol and gasoline in

automobile car [19]. The maximum concentration of Zn in water of Ghol dam may be due to zinc leached from defense plates of boats which contains active zinc material [20].

Heavy metal concentration in soil was found in the order: Fe>Ca> Cu>Zn>BP>Ni=Cr. The maximum values of heavy metals (Fe, Ca, Cu, and Pb) were recorded at Ghol dam in Soil Sample while Ni and Cr were not detected in Soil samples of Ghol dam. Iron is a fundamental element of blood and responsible for imparting red color to blood. High concentration of Iron causes bad taste, discoloration, staining, turbidity, esthetic and operational problems in water supply system [21]. High level of iron can harm plants, animals and cause health problems in humans [22]. Lead is a toxic heavy metal cause's anemia, brain damage and vomiting [23]. The high level of lead in soil could be attributed to the agriculture and industrial discharged as well as combustion of leaded petrol and some other types of gasoline [24]. By comparing the accumulation of heavy metals in soil and water, it can be concluded that the metals are highly accumulated in soil than water. Since the soil act as reservoir for all dead organic matter and contaminates the ecosystem.

Conclusion

From the study of physicochemical parameters of water collected from Ghol dam it was concluded that water of this lake is suitable for domestic utilization and other human purposes. It was also concluded that water of this lake is suitable for fish breeding. Hence, our study would provide useful information to fish culturists and fisheries managers for promoting the fish culturing in the local area to raise the economic and social benefits for the local population of Karak district. These studies also reveal that different sampling sites have different concentrations of the metals. The concentration levels of certain heavy metals are alarmingly high in all the areas considered for sampling. Keeping in view the health risks involved due to the high levels of metals when they enter the human metabolism, measures should be taken to minimize these levels in the clean waters to lessen the imminent health risks.

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