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Physicochemical Analysis of Water and Soil Collected From DandiIdharKhel Lake Karak and Its Effects on Fish Breeding

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Abstract: Anthropogenic activities subsequently alter physical and chemical parameters of water and soil which may have devastating and drastic influences on many biological life forms. Biogenic processes also have negative implications on physicochemical factors of water which alter the rate of biological productivity, migration and survival of fish. For this purpose eight samples of water and soil were collected from DandiIdarKhel Lake. These samples were analyzed for physicochemical parameters including pH, conductivity, TDS, color, odor and elasticity. The obtained results investigated were pH=7.21 for water samples and pH=7.26 for soil samples, TDS=50mg/50ml for water samples and TDS= 80mg/50ml for soil samples, conductivity=1.08µS/cm for water samples and conductivity=3.92µS/cm for soil samples. It was concluded from results that physical and chemical parameters of water and soil were within the normal range given by WHO and also water of DandiIdarKhel Lake is suitable for fish breeding.

Key words: Water · Soil · Physiochemical · Dandi Idharkhel Lake

INTRODUCTION

Quality of water is usually a prominent and most important concern where aquaculture is practiced. Sustaining and maintaining a healthy environment is not only essential to the organisms being cultured, but also, to the fauna and flora that are inhabitants of this site, as well as the migratory species that circulate through and around the site [1]. Water is an essential resource for industries, agriculture, manufacturing and other activities of human beings. In urban areas, the disposal of industrial wastes or effluents due to human negligence and other wastes in rivers and lakes mostly contribute to the poor quality of river water. Most of the rivers in the cities of the developing countries are extremely contaminated by effluents discharged from the industries. Asian countries are facing rapid industrial growth and it is because of this environmental conservation is a difficult task to achieve

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[2]. Water quality is described in term of its physical, chemical and biological factors. Physicochemical factors like temperature, TDS, hardness, pH and conductivity varies with changes in seasonal variations, geographic areas and mostly with anthropogenic activities. Water quality guidelines mostly provide information about water quality parameters and also give an idea about ecological relevant toxicological threshold values in order to conserve water utilization and also flora and fauna inhabiting the aquatic ecosystems. Important physical and chemical parameters affecting the environment of aquatic ecosystems are temperature, salinity, pH, rainfall CO_2 etc [3]. Contamination of the aquatic ecosystems occurs when humans add either by direct discharge into water bodies or indirectly through atmospheric or water management practices and other anthropogenic activities, substances or energy that lead to deleterious effects such, harm to living resources, hindrances to aquatic activities such as fishing, hazards to human health, impairment of water quality with regards to its use in agriculture and effects in the breeding and productivity of fish [4]. The role of several parameters can't be neglected for maintaining and sustaining a healthy aquatic environment in aquatic ecosystems and for the suitable production of sufficient fish food organisms in ponds, lakes, streams or rivers for increasing the productivity of fish. Therefore, it is very necessary to ensure that, these environmental parameters are properly managed, sustained and regulated for good survival and optimum growth of fish [5]. Because of increased human population, industrialization has grown considerably. Use of fertilizers in agriculture and anthropogenic activities are increased which result in aquatic contamination. The biogenic and anthropogenic activities are causing heavy and varied pollution in aquatic environment leading to water quality and depletion of aquatic biota [6]. Quality of water is a term used to describe the physicochemical features of water in relation to all other hydrological parameters, usually in respect to its convenience for a specific purpose. Any feature of water that affects its portability, life, reproduction, growth and productivity of aquaculture species, affects management decisions, causes environmental impacts or reduces product quality and safety can be considered a water quality variable [6]. The aim of the study was to provide useful information's 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.

MATERIALS AND METHODS

Collection of Samples: 8 sample of water and 8 sample of soil were collected from DandiIdarKhel Lake of District Karak. Samples were analyzed for physicochemical parameters in order to see the impact of physicochemical factors of this lake on the productivity and breeding of fish. Physicochemical features of this lake were also compared with the permissible limits for physicochemical parameters given by World health organization (WHO) in order to study the status of this lake that whether its water is able to utilize for domestic purposes and other human purposes or not.

Sample Treatment: Soil samples were oven dried at a temperature of 110°C. After all the moisture in the soil was removed and it was completely dried, it was ground to a fine powder. 7 grams of powder of each soil sample was taken and was mixed with 15ml deionized water in order to prepare soil slurry. After mixing of soil with distilled water, they were stirred continuously for some time so that soil slurry was prepared. Soil samples in the form of slurry were then subjected to physicochemical analysis. Water samples were directly subjected to physicochemical analysis.

Sample Analysis: Conductivity of soil and water was measured using conductivity meter (Model 103 Jencos). Conductivity meter was first calibrated using 0.1 molar solution of KCl. After calibration water and soil samples (In the form of soil slurry) were subjected to conductivity meter and readings from conductivity meter were recorded as results for the conductivity of soil and water. pH of water and soil was measured using pH meter (Model 3505 Jenway). pH meter was calibrated using the buffer solutions of pH=4 and pH=8. After calibration, pH of soil slurry and water was measured and readings from pH meter were recorded as results for the pH of soil and water.

RESULTS AND DISCUSSION

The Present study was conducted on the water and soil collected from DandiIdarKhel in order to analyze them for physicochemical parameters and their results are presented in Table 1.

pH: Many biological, physical and chemical processes in natural waters such as rivers, streams and lakes are significantly and considerably influenced by some change

Table 1: Physicochemical parameters of water and soil samples collected from DandiIdarKhel lake Karak

Type of sample	pH	Conductivity (µS/cm)	Color	Odor	TDS	Elasticity
Water sample	7.21	1.08	Colorless	Odorless	50mg/50ml	Non elastic
Soil sample	7.26	3.92	Black brown	Odorless	80mg/50ml	Non elastic

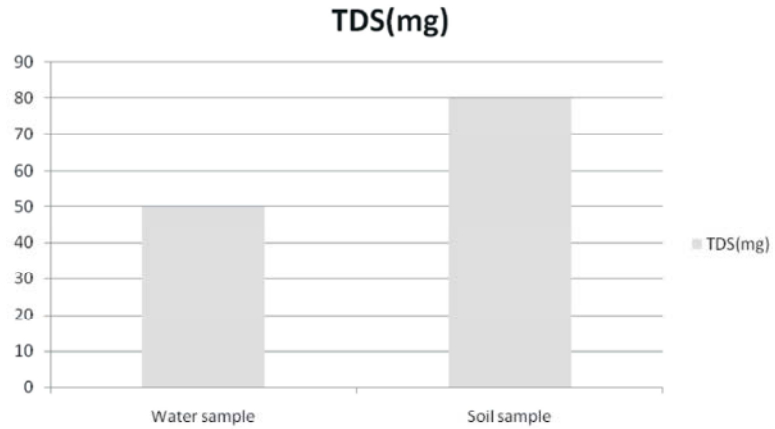

Fig. 1: TDS of water and soil samples collected from Dandi Idhar Khel Lake

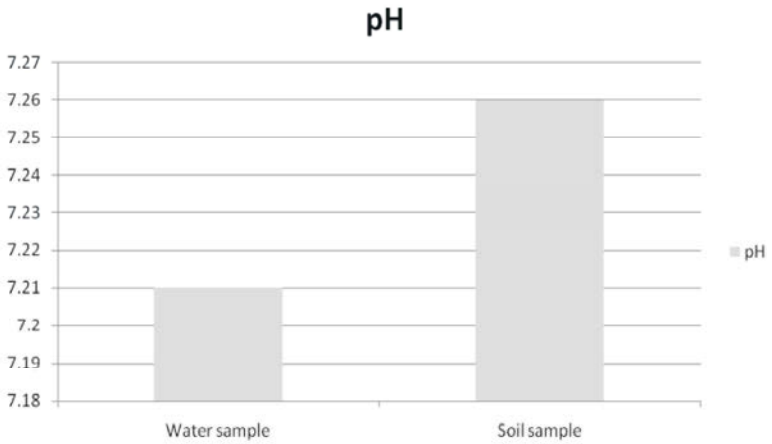

Fig. 2: pH of water and soil samples collected from Dandi Idhar Khel Lake

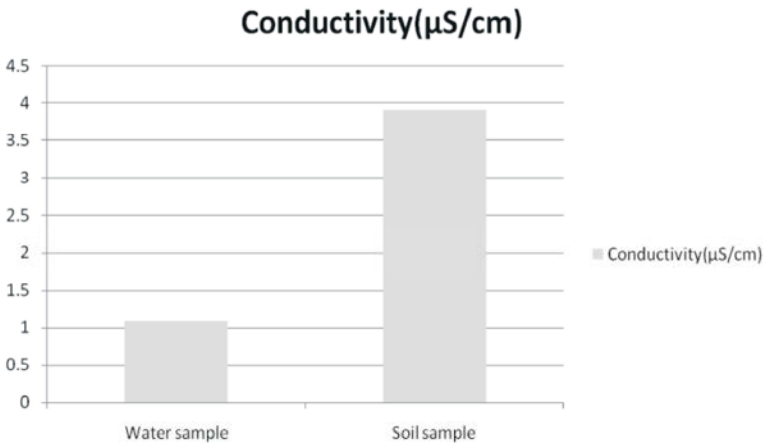

Fig. 3: Conductivity of water and soil samples collected from Dandi Idhar Khel Lake

in the pH value. For example, the surface charge of colloids in natural waters and hence their ability to coagulate or sorb ions will depend on the pH of natural water as well as the solubility and speciation of dissolved ions. In most fresh natural water rivers, streams or lakes the pH typically ranges between 6.5 and 7.5.According to WHO permissible range of pH for water and soil is 6.5-8.5 [8]. pH of soil and water collected from DandiIdarKhel lake is within the permissible range. Generally pH between 7.0 to 8.5 is more optimum for the survival of fish. pH between 7 to 8.5 is more convenient for biological productivity of fish. Fish become very stressed in water whose pH ranges from 4.0 to 6.5 or 9.0 to 11.0 and death almost occurs at a pH less than 4.0 or greater than 11.0 [4]. From the results it was concluded that pH of water of DandiIdarKhel Lake is suitable for fish breeding.

Conductivity: Electrical conductivity gives information about the amount or concentration of electrolytes in water and is the limiting factor. Electrical conductivity which measures water's ability to conduct an electric current and is related to the amount of dissolved minerals and salts in water, but it does not give an indication of which element is present in water but higher value of EC is a good indicator of the presence of pollutants such as sodium, potassium, chloride or sulphate [9].According to WHO permissible range of conductivity for water is 400-600µS/cm. Conductivity of water and soil was recorded below the normal range given by WHO. Convenient and suitable range of electrical conductivity for fish breeding and productivity is 30-5000mS/cm. From results it was indicated that electrical conductivity of water of DandiIdarKhel stream is suitable for fish breeding. Conductivity has no effect on fish because deviation of conductivity from the normal range does not affect the fish severely but fish becomes tolerable [10].

Total Dissolved Solids: TDS analysis has many implications in the control of biological and physical waste water treatment processes [11]. According to WHO normal range of TDS for water is 50-250mg/ml TDS of water and soil samples collected from DandiIdarKhel Lake was within the permissible range given by WHO. Total dissolved solids (TDS) are the extent or measure of dissolved materials in water. TDS can be poisonous to aquatic life through changes in the composition of the water or increase in salinity, or it may comprise substances that are toxic to people or aquatic life. Most of the aquatic ecosystems comprised of mixed fish can tolerate TDS levels of 1000 mg/l [12]. TDS of water collected from Dandi Idar Khel Lake was recorded convenient for fish breeding.

Color: Water samples collected from DandiIdarKhel Lake were colorless while soil samples had blackish brown color.

Odor: Water and soil samples collected from DandiIdarKhel Lake had no odor.

Elasticity: Both water and soil samples collected from DandiIdarKhel Lake were non elastic.

All the physicochemical parameters of soil and water were compared with WHO standards and also with the normal standards required for fish breeding. All the physical and chemical parameters of soil and water were found within the normal range given by WHO and also water of DandiIdarKhel Lake was found to be convenient for fish breeding.

CONCLUSION

From the study of physicochemical parameters of water collected from DandiIdarKhel Lake 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

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