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Physicochemical Analysis of Water and Soil of Tarbela Dam in Northwest of Islamabad, Pakistan, with Special Reference to Their Influence on Fish Growth

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Abstract: This study was conducted to analyze the physiochemical properties like color, odor, electrical conductivity, pH, temperature, total dissolve solids and elasticityof water and soil samples collected from Tarbela dam of district Haripur and also to investigate the suitability of soil and water on growth of fish. The recorded and analyzed data of the current study disclosesthat all physiochemical parameter were found to be in allowable range and are non-fatal for growth of fishes. Hereafter, thisstudy provide convenient assistance to the aqua culturists and fisheries managers to further mend the conditions of dam for growth and survivalof fishes.

Key words: Physiochemical Characteristics of Water and Soil · Tarbela Dam · Effect on fishes growth

INTRODUCTION

Tarbela Dam is the world largest earth filled dam and second largest by structural volume [1-3]. The name Tarbela was given to it after town Tarbela located in Haripur District [6] Khyber Pakhtunkhwa, about 50 Km northwest of Islamabad, near Topi (Fig. 1). The dam is 485 feet (148 m) high above the riverbed. The dam was completed in 1976 and was designed to store water from the Indus River for irrigation, flood control and the generation of hydroelectric power.

Themarinebiome is the world most complicated environmental sciencewherever water is the most imperious resource for aquatic lifespan and is correspondinglyvital for the survival of living beings in open-air. It is also obligatory for the domestic use, in irrigation, industrial sector, agricultural and fishery. Subsequently, analysis of physicochemical parameters of water is relatively crucial as adulterated or polluted water couldn't be used for any purpose [4]. Fishes are the main and chief source of protein for us, have antidepressant properties that why it is convenient to focus on their

Fig. 1: Map showing Tarbela dam, KPK, Pakistan, Asia.

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proper growth. The population of fishes tremendouslydepends upon the physiochemical featuresof their environment which help in maintenances of their biological function and also the physicochemical properties of soil play vital role in maintenance of healthy environment [5-12]. Fish are motivated to the areas that are physiologically best by their physicochemical environment [13, 14].Frequentresearches have been conducted on theanalysis ofphysiochemical parameters of water and soil with respect to their impact on fish growth investigated the relationship between diverse species of fishes and the effect of water salinity, temperature and dissolve oxygen on their existence.Supplementary studies determined that when pH level of water approaches 9.06 to 10.0 the school of fishes starts to migrate [15, 16].Hence the conducted research evaluating the quality of water and soil of Terbela dam for appropriate growth and easy survival of fishes by means of some selected physicochemical parameters. The present study will provide useful information for monitoring the changes in the water and soil quality so as to improve the growth.

MATERIALS AND METHODS

Study Area: The contemporaneous study was performed on Tarbela dam, located in Haripur District, Hazara Division, Khyber Pakhtunkhwa, about 50 kilometers northwest of Islamabad (geographical coordinates are34° 5' 14" North, 72° 41' 3" East) (Figure 2).

Sampling: Six samples of soil and water were collected from Tarbela dam. Water samples were collected in thoroughly washed vessels, while soil samples were collected from near the bottom of the dam and placed in an air tight bottle for further analysis.

Physiochemical Characteristics: The physiochemical physiognomiesi.e. TDS, EC, color, temperature, odor, pH and elasticity of both samples was analyzed. Features like color, odor were noticed at the time sampling while the remaining characters were studied in lab.

Electrical Conductivity & Total Dissolve Solids: Electrical conductivity and TDS of both (water and soil) samples were analyzed by means of *Jenway* conductivity meter, 0.1 M solution of Potassium chloride was used for its calibration. The electrodes were washed properly before and after dipping it into water and soil samples.

Temperature and Hydrogen Ion Concentration: Thus it is convenient to determine the temperature of the dam as it helps in understanding the behavior of life under water. For temperature and pH measurement APHA method and Electrical *Jenway* pH meter was used individually [17, 18].

RESULT AND DISCUSSION

Color, Odor & Elasticity: Even though color of soiland watervaries place to place, these colors specify whether theyare suitable or not for the growth and survival of organisms beneath water like light greenish and greenish colored water is suitable for the growth, while dark green and brown colored water isdeadly for growth [19]. Similarly the presence of plankton was also confirmed by the help of water color. Bluish green and brownish green shows plenty of planktons, affect the ecology directly or indirectly [20]. Odor also has aesthetics effect on aquatic survival. When industrial waste drained into these water bodies they not only contaminates the water but also soil and produce odor (Table 1).

Total Dissolve Solids: The permissible limits of TDS in both soil and water are shown in (Tables 1 and Fig. 3). The values lies within dissolved limits suggested by WHO (i.e. 500-1000mg/l)[21],Henceforward suitable for sipping and alsoappropriate for the growth of fishes.

Fig. 2: Tarbela dam's view

Table 1: Showing physiochemical parameters of Tarbela dam

Samples	Temperature °C	pH	Conductivity μs/cm	TDS mg/50 ml	Color	Odor	Elasticity
Water	29.63	6.40	0.23	63	colorless	odorless	nonelastic
Soil	30.6	7.56	0.10	41.5	blackish	odorless	nonelastic

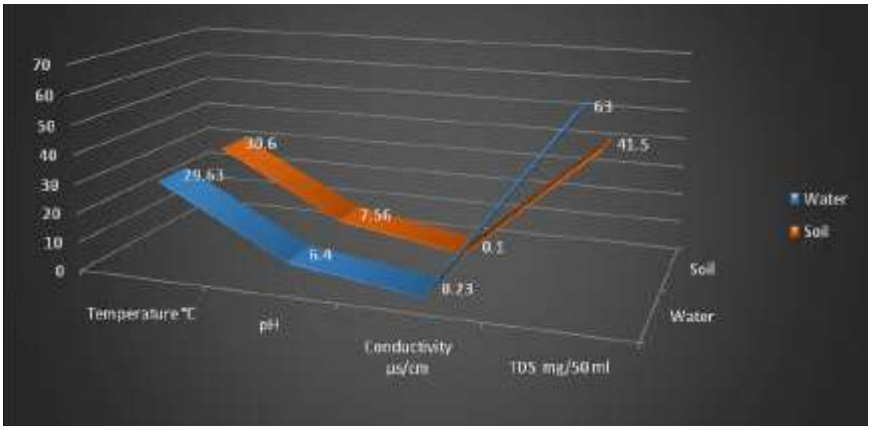

Fig. 3: Graph showing the comparative study of different parameters of water and soil from Tarbela dam

Temperature: As describe temperature greatly affect the ecosystem. Being cold blooded the metabolic activities; lifespan, reproductive capabilityetc. directly depend on the temperature of water. The prime temperature required for the survival of fishes ranges from 26-32 °C [22]. The temperature beyond the range may increase the growth of microorganism, causingin ecosystem (marine life). Hence from current research it can be concluded that the temperature is suitable for the growth.

Electrical Conductivity: The functional range of conductivity varies from 15-500 μs/ml, values beyond this range specifies that the water is not fit of the survival of fishes [23]. Current research shows that the EC valueof water and soil samples collected from Tarbela dam were found to be in range i.e. 0.23 and 0.10μs/cm individually. Hydrogen ion concentration:The optimal pH of water and soil, supporting the growth varies from6.5-9.5 and 6.5 to 8.4respectively [24, 25]. The pH of samples from Tarbela dam is in range supporting the growth of fishes.

CONCLUSION

The research was conducted as growth of fishes dependent on the physical and chemical quality of water and up to some extent on soil too. From the physiochemical analysis of Tarbela dam samplesit can be concluded that it is suitable in all respects for the growth andreproduction of fishes as the values of all parameters within the permissible range.

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