



RESEARCH PAPER

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Water quality parameters of river Swat at District Charsadda, KPK, Pakistan

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Abstract

A preliminary survey was carried out in which water quality parameters of River Swat locally called River Khiali was determine that flows through district Charsadda, Khyber Pakhtunkhwa, during the year 2017 (March to July). During this study the mean values recorded for water quality parameters were air temperature 33.6°C, water temperature 23.2°C, rate of flow of water 0.594, TDS 146 mg/l, TSS 119.4, depth 2.46, pH 7.32, and alkalinity 89.4 mg/l. All these values were within the limits prescribed by the standard methods for the examination of water, sewage and industrial wastes.

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Introduction

The ecosystem consists of three major components i.e. Water, air, and soil. The aquatic ecosystem has generally been divided into two types: fresh water and marine ecosystem (Mishra and Saksena 1992). The science dealing with the study of fresh or saline waters within continental boundaries is called limnology. Limnological studies include the physiochemical and biological parameters of fresh waters. These are used to analyze the quality of water (Goldman and Home, 1983; Boyd and Tucker, 1998). Under nomenclature used to name chemical compounds, Dihydrogen monoxide is the scientific name for water, though it is almost never used (Barmer and Scott, 2011).

Water is the precious gift of God without life cannot exist. Water is a basic requirement for all living things (Maryllyn, 1997). It is very important for human and all other living beings as food. So, it is one of the most abundant and widely distributed substances in nature (Latif, 1999). Water is one of the abundantly available natural resources. Life on the earth began in water. Water is essential for the survival of any form of life including all kinds of human, insects, birds, animals, plants, etc. The regular monitoring of water quality has become a crucial factor in the conservation of aquatic resources (Magudeswaran and Ramachandran, 2007). Water is the most important in shaping the land and regulating the climate. It is one of the most important compounds that profoundly influence life (Gorde and Jadhav, 2013).

Water is one of the most important and abundant compounds of the ecosystem. All living organisms on the earth need water for their survival and growth. As of now only earth is the planet having about 70% of water (Basavaraja *et al.* 2011). Water is the principal need of life on earth, and is an essential component for all forms of lives, from microorganism to man (Praveen *et al.*, 2012). Water resources are of critical importance to both natural ecosystem and human development. It is essential for agriculture, industry and human existence. The healthy aquatic ecosystem is depended on the physicochemical and biological characteristics (Venkatesharaju *et al.* 2010).

Water quality deals with the physical, chemical and biological characteristics in relation to the hydrological properties. Water quality parameters which affect the survival, reproduction, growth and production of aquatic species are called water quality variables (Chhatawa, 1998).

The term water quality comprises the water column and the physical channel required to maintain and sustain aquatic life (Kankal *et al.* 2012). Physical, chemical and biological characteristics of water are considered as a main health controlling factor and the state of disease in the living organisms.

The availability of good quality water is an indispensable feature for preventing diseases and improving quality of life (Kazi *et al.*, 2009). The aim of the current research work was to find out the water quality parameters of River Swat at District Charsadda, KPK, Pakistan.

Material and methods

River Swat

River Swat is one of the main water ways flowing through Khyber Pakhtunkhwa. The word Swat means ideal; the river being an ideal and popular spot in the native history. Geographically Swat is a downstream strip river Swat. The river Swat originates as a gushing stream from the perpetual ice caps of the majestic mountains of Swat Kohistan (Yousuf, 2004).

It rejuvenates at Kalam with the union of Ushu and Utror River and flows for about 160 Kilometers across the valley up to Chakdara.

The river flows narrowly and swiftly from Kalam to Madyan never acquiring more than an average width of 35-40 Km. The narrow course of the river continues up to Thalapanand (Ibrar, 2010). From Swat district it runs through lower Dir meeting with the Panjkora River, flowing through Malakand it enters Peshawar from where it enters Charsadda after covering an approximate distance of 15 Km (Tajik, 2007). This is the district where it comes to be known as Swat.

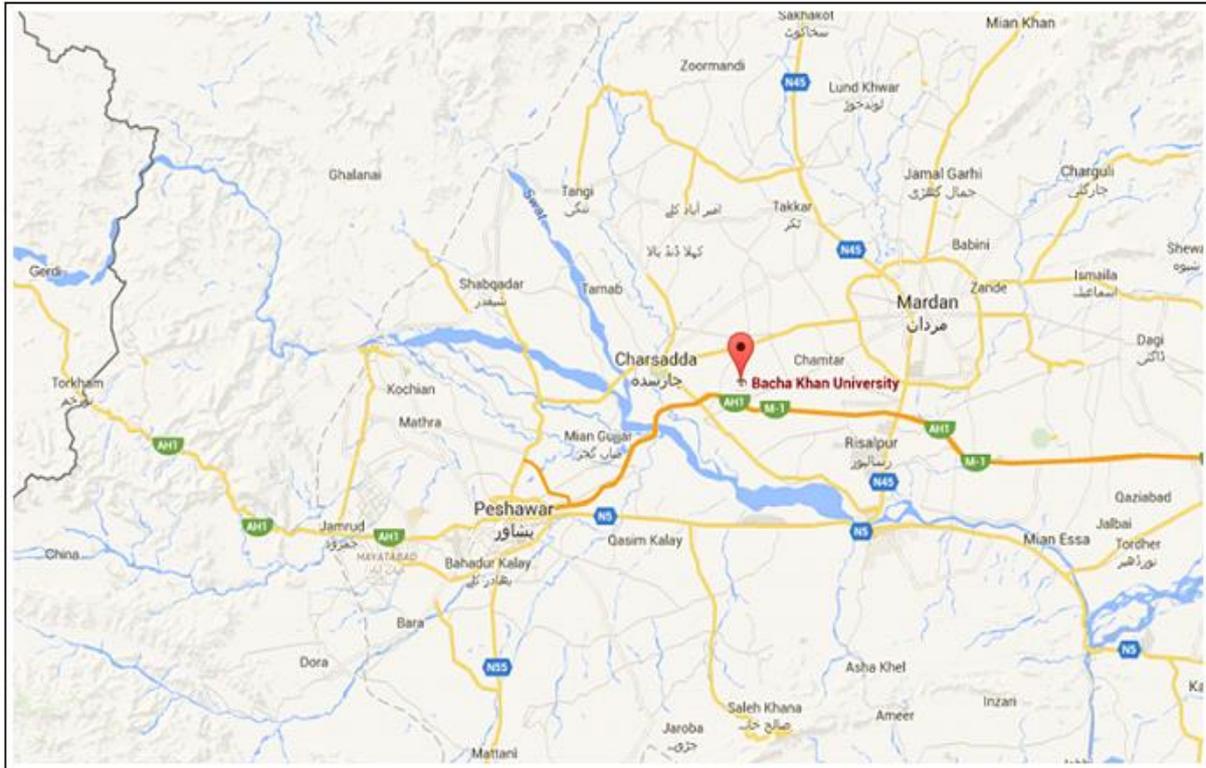


Fig. 1. Map of River Swat Showing the Downstream Parts (Khiali).

The Journey of the rivers continues, having yet another merge, this time with river Kabul (Sardaryab) about 16 kilometers south west of proper Charsadda.

Study area

Charsadda is a town and headquarter of Charsadda District, in the Khyber Pakhtunkhwa province of Pakistan. Pashtuns make up majority of the population of the district.

The district lies between 34-03' and 34-38' north latitudes and 71-28' and 71- 53' east longitudes. Charsadda is located in the west of the Khyber Pakhtunkhwa and is bounded by Malakand District on the north, Mardan district on the east, Nowshera and Peshawar districts on the south and the Mohmand Agency of the Federally Administered Tribal Areas on the west.

The total area of this district is 996 km². If we talk about history of Charsadda District so we became to know that, Charsadda District was once part of the kingdom of Gandhara.

The city of Charsadda originally known as Pushkalvati is first mentioned in the Hindu epic story the Theramayana. The district is subdivided into three tehsil which contained a total of 49 union councils (Inamulhaq, 2014).

Water sample collection

For physiochemical parameters water will be collected from three selected point of river, the water will be collected on monthly basis three times in plastic bottles with a capacity of 1.5 liters from March to June, 2017. Water samples will be brought to the chemistry lab of college for determining the physiochemical parameters. Those parameters which measurement are possible are recorded on the spot, such as pH, Temperature, depth, and flow rate of water etc.

Rate of flow of water

Rate of flow of water is the distance covered water in a unit time. Rate of flow of water was measured as follows: Two point "A" and "B" were marked on the bank of river 150 meters apart.

Then a wooden piece having density equal to that of water having its upper surface parallel to water was thrown in water at point "A" and the time was noted. When the wooden piece reached the point "B" the time was noted again. The total time taken to reach the wooden piece from point "A" to "B" was determined. The wooden piece of different sizes was used for six readings.

Depth

Depth of water at various points was determined by dipped vertically a rod about 5 meters long graduated in cm.

Temperature

The temperature of surface water of the river was determined directly on the spot by means of simple mercury thermometer. The reading was taken by rightly keeping the bulb depth inside the sample water. Before the temperature of the atmosphere was taken.

pH

pH of the water was determined at the spot by pH paper (Toyo test paper) having a pH detection rang 0-14. The pH paper was read by dipping it in a beaker filled with fresh water sample six readings at different interval were taken in the same manner.

Total Dissolved Solid (TDS) and Total Suspended Solid

Total Suspended Solid were measured by filtering and evaporating a sample of water and then calculating the values by weighting the remains by a physical balance.

Alkalinity

Alkalinity of water was determined by titrimetric method. A conical flask was taken and washed with distilled and sample water. Then 25 ml of water sample was taken and added three to four drops of methyl orange. Titrate it against 0.02 N H₂SO₄ until the color of sample water was changed from orange to blue. Note the reading directly from burette and used the formula below:

$$\frac{Std. sol. vol use \times std sol. con \times M. wt of cacO_3 \times 100}{used sample water volume}$$

Results

The obtained result of the current research work conducted water quality parameters of River Swat at District Charsadda, KPK, Pakistan shown in fig.2-9.

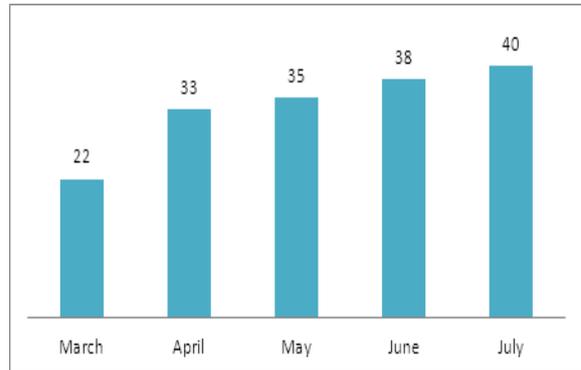


Fig. 2. Air temperature values of Charsadda (°C).

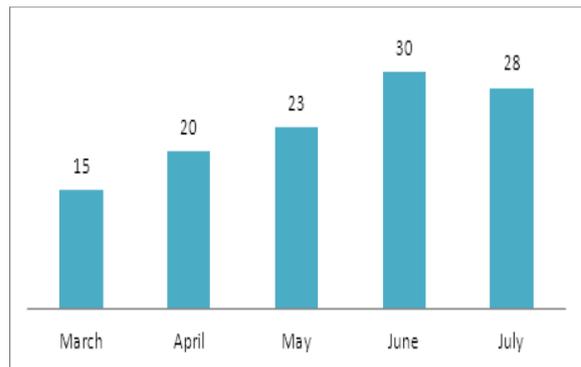


Fig. 3. Water Temperature Values of River Swat at Charsadda (°C).

Discussion

Air temperature

The values of air temperature for the study period of march to July were 22°C, 33°C, 35°C, 38°C, 40°C respectively with mean value of 33.6°C showing highest values in the month of July and lowest in the month of march. The changes in air temperature may be due to the climatic changes and intensity of the sunlight. Water temperature the values of water temperature for the study period of march to July were 15°C, 20°C, 23°C, 30°C, 28°C respectively with mean value of 23.2°C showing highest values in the month of June and lowest in the month of march.

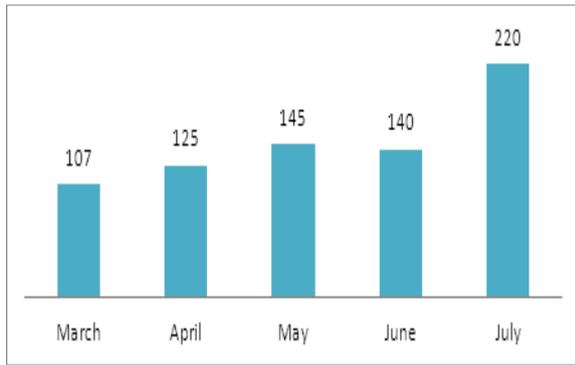


Fig. 4. Total Dissolved Solids in Water of River Swat at Charsadda (mg^l⁻¹).

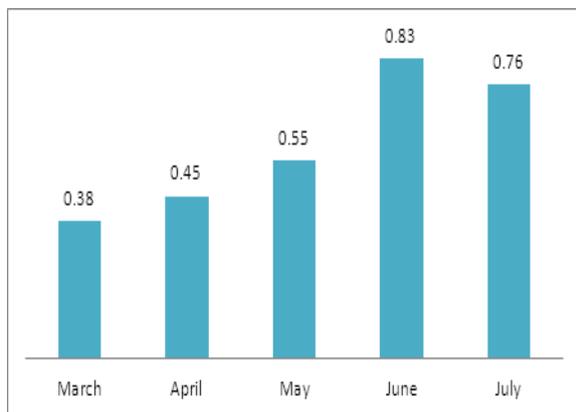


Fig. 5. Rate of Flow of Water of River Swat at Charsadda (ms⁻¹).

Rate of flow of water

The values of rate of flow of water of river Khiali for study period of March to July were 0.38, 0.45, 0.55, 0.83, 0.76 meters per second with mean value of 0.594 showing highest values in the month of June and July lowest in the month of March. This variation is May due to environmental changes during the study period.

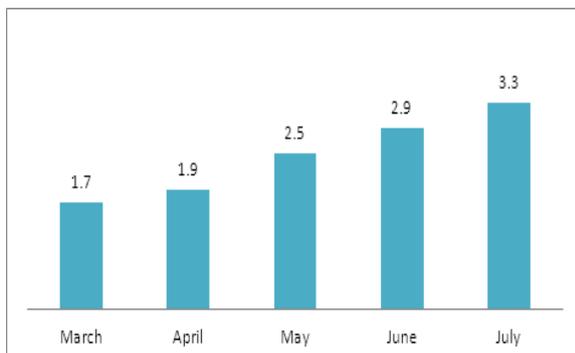


Fig. 6. Depth of Water in River Swat at Charsadda (meter).

Total suspended solids

The value of TSS for the study period of March to July was 75,110, 150,127, 135mg/l respectively with mean value 119.4mg/l, showing highest values in the month of May and July while lowest in the month of March.

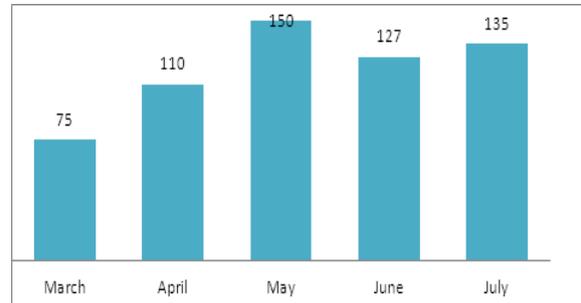


Fig. 7. Total Suspended Solids in Water of River Swat at Charsadda (mg^l⁻¹).

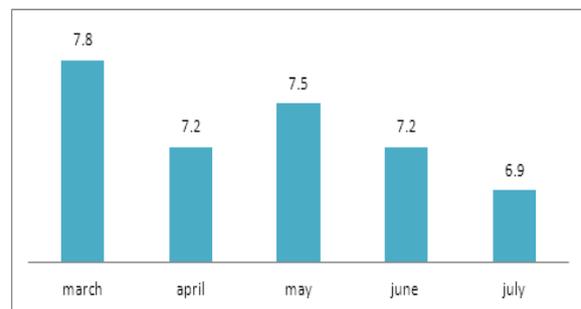


Fig. 8. pH of Water of River Swat at Charsadda.

Total dissolved solids

The value of total dissolved solids for the study period of March to July were 100, 125, 145, 140, 220mg/l respectively with mean value of 146mg/l showing the highest value in the month of July and may while lowest in the month of March.

Depth

The values of depth of river Khiali for study period of march to July were 1.7,1.9,2.5,2.9,3.3 meters respectively with mean value of 2.46 showing highest values in the month of July and lowest in the month of march. The variation in depth is mainly due to climatic changes.

PH

The values of pH for the study period of March to July were 7.8, 7.2, 7.5, 7.2, 6.9 respectively with mean value 7.32, showing highest values in the months of march and may while lowest in the month of July.

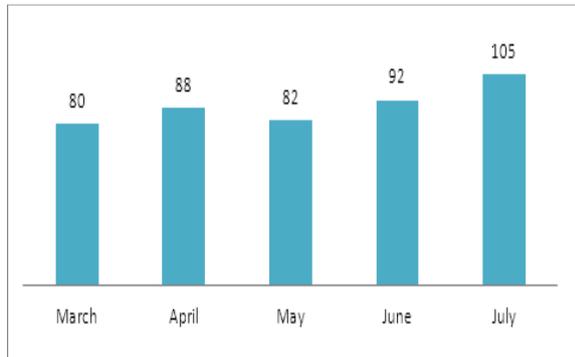


Fig. 9. Total Alkalinity values of River Swat at Charsadda (mg l⁻¹).

Alkalinity

The values of alkalinity for the study period of March to July were 80, 88, 82, 92, 105 respectively with mean value of 89.4 mg/l, showing the highest value in the month of July while lowest in the month of May.

Conclusion

It was concluded from the current study that river River swat is facing the illegal human activities like; domestic and anthropogenic activities, agricultural runoff, introduction of vehicle oils, riverine flood etc. The harmful and novel introduction of fishing gears by fisherman such as electrical shocks, chemicals also affects the fish population of river Swat. From the current study it was concluded that all the physicochemical parameters showed the safe range according to water quality standards of APHA. Water quality shows suitability for varieties of fish survival and breeding season such as *Tor macrolepis* (mahseer), *Mastacembelus armatus* (Marmahi), etc.

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