



## Evaluation of physico-chemical and microbiological parameters of Jhajjar rivulet of J&K

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### Abstract

Water quality is an index of health and well being of a society. The pollution of water bodies is one of the areas of major concern to environment. In the present investigation an attempt has been made to evaluate the physical, chemical and microbiological parameters of Jhajjar rivulet of J&K. The study has been carried out by taking water samples at three different sites of the rivulet i.e. site 1, site 2 and site3. During the study, the physico-chemical parameters like pH, temperature, colour, total hardness, BOD, COD, DO, TDS and TSS in the water samples were studied. In microbiological examination, the presence of coliform in the water samples were studied. It has been observed that there was a pollution load mostly at site 3 and slightly at site 2, it may be due to the release of huge quantities of sewage, effluent and manmade activities at the respective sites but the water from all the sites was found free from microbial contamination. It was concluded that water at site 1 is suitable for drinking as compared to site 2 and site 3 of the rivulet.

**Keywords:** Dissolved oxygen, Jhajjar rivulet, total suspended solids, total dissolved solids, water quality

### Introduction

Water is a key component in determining the quality of our lives. Today, people are concerned about the quality of the water they drink. Although water covers more than 70% of the Earth, only 1% of the Earth's water is available as a source of drinking. Yet, our society continues to contaminate this precious resource. Before it reaches the consumer's tap, it comes into contact with many different substances, including organic and inorganic matter, chemicals, and other contaminants. Most illnesses that arise from contact with sewage are caused by pathogens, which are biological agents that cause disease or illness in a host. The most common pathogens in sewage are bacteria, parasites, and viruses. They cause a wide variety of acute illnesses including diarrhea and infections. In some cases, however, pathogens can cause serious long-term illnesses or even death. Keeping in view the tremendous importance of water for human health, we are trying to study the physical, chemical and microbiological parameters of the water of Jhajjar rivulet (Jammu & Kashmir). Jhajjar also spelled as Jhajjar Kotli is situated about 35 km away from Jammu on the national highway leading towards Srinagar in Kashmir. The discharge

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of huge quantities of sewage, effluents and more of the man made activities etc., have been major concern in water pollution. These effluents without proper treatment are discharged into the nearby aquatic bodies in large quantities causing massive destruction of aquatic flora and fauna by means of suspended solids, immediate depletion of oxygen content, undesirable taste and odour creating substances and by interfering the respiratory metabolism of the animals and aquatic lives. The small tourist site was constructed on the bank of Jhajjar rivulet that cascades through the valleys of this enchanting state of Jammu and Kashmir filled with clear and soothing water that often attracts a large crowd of tourists and local to its scenic picnic spots especially during summer season. The water of Jhajjar is used in many of the local areas like Sirah, Panthal, Manthal, Kakryal etc. The water is also supplied to Shri Mata Vaishno Devi University and Katra city. The Katra city is one of the biggest tourist place in Jammu and Kashmir due to Shri Mata Vaishno Devi. Jhajjar rivulet water is mainly used in these important areas for drinking, cooking, washing, bathing and for all the household purposes. Numerous aspects of river pollution such as physico-chemical properties of different river water (Mitra, 1982; Raina *et al.*, 1984) and changes in biological composition of rivers with respect to

impact of pollutants (Bhatt *et al.*, 1985; Shukla, 1994) have been reported in India. Some investigation has also been conducted on physico-chemical and biological aspects of river Godavari at different places (Deshmukh *et al.*, 2006). As the quality of Godavari river water is getting deteriorated day by day and there is paucity of data on the pollution status. For physico-chemical analysis of water samples were collected from three different sites (Site 1 – Near Someshwar temple, Site 2 – Ramkund, Site 3 – Tapovan) (Fig. 1-3). Water samples were collected once in a month during the period Nov. 2002 – Oct. 2003. Samples were collected in cleaned plastic containers. Temperature and pH were measured in the field itself using digital thermometer and pH meter respectively. While remaining parameters were analyzed in the laboratory following the standard methods given by APHA (1998), Trivedy and Goel (1986). Similar observations were observed by Chakraborty and Asthana (1984), Mehta (1999) and Khanna and Bhutiani (2003).

### Material and Methods

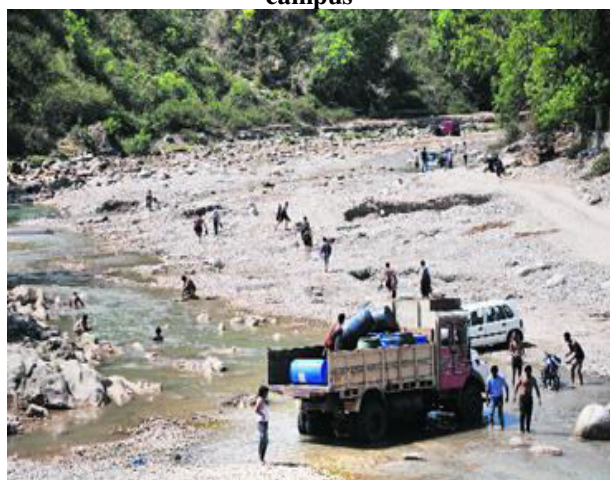
The collected samples were stored in cleaned, high density polyethylene (HDPE) bottles. The use of HDPE bottles minimizes container pollution and promotes the sample preservation (Hall, 1998)]. Samples were stored in refrigerator at 4°C prior to analysis. The physico-chemical parameters and biological parameters were analysed following the standard methods of APHA (1998), Trivedi and Goel (1986) and Khanna and Bhutiani (2004). The temperature was recorded at the different sites with the help of mercury thermometer, pH were measured in the field itself using pH metre and dissolved oxygen was analysed in the laboratory using Wrinkler's modified iodide-azide method. Chemical oxygen demand (COD) is measured by dichromate reflux method using a ferroin indicator. Hardness of sample is determined by complex metric titrations. The total coliforms test was performed using standard method of multiple tube fermentation tests. The test consists of three steps a presumptive test, confirm test and completed test. In the present study presumptive test was performed using five tube methods. The test tubes were incubated for 24 to 48 hours and then examined for the presence of coliforms which is indicated by gas and acid production.



**Fig 1. Sampling site1 showing upstream of Jhajjar**



**Fig.2. Showing sampling site 2 near the university campus**



**Fig.3: Showing sampling site 3 Downstream of Jhajjar after the Jhajjar Kotle park**

## Results and Discussion

The Physico-chemical and biological studies of Jhajjar rivulet at three different sites has been shown in table 1. In the present study it was observed that the colour of water samples collected from all the three sites such as Site 1, Site 2 and Site 3 was found transparent. The pH value of pure water is 7 while alkalinity or acidity has effect on it. The pH of sample at Site-1 and Site 2 was recorded as 7.2 while at Site-3 it has shown basicity i.e., 8.0.

Sharma *et al.*, (2011), reported the water was alkaline throughout the study. It may be due to the addition of some waste discharges from the surrounding communities which is of alkaline in nature. The total suspended solid (TSS) is a measure of degree of quality of water and its presence is objectionable in river for many reasons. In this study the total suspended solids has been found 25mg/l at Site 1, 28mg/l at site 2 and 32mg/l at site 3.

**Table 1: Physico-chemical and microbiological parameters of water at different sites of Jhajjar rivulet**

S.No	Parameters	Site 1	Site 2	Site 3
1	pH	7.2	7.2	7.5
2	Colour	Transparent	Transparent	Transparent
3	Temperature ( $^{\circ}$ C)	20	20	20
4	Total hardness Ppm	119	125	125
5	B.O.D(mg/l)	6	6	8
6	D.O(mg/l)	9	9	7
7	C.O.D(mg/l)	17	20	20
8	TDS (mg/l)	20	26	26
9	TSS(mg/l)	25	28	32
10	MPN count of coliforms/100ml sample	6	11	11

Whereas the total dissolved solid observed at site 1 was 20mg/l and at the other sites it was 26mg/l. Hardness of water is mainly due to  $\text{Ca}^{++}$  and  $\text{Mg}^{++}$  ions present in water. The hardness of water measured at Site 1 was 119 ppm and 125 ppm at Site 2 and Site 3. The higher concentration of chlorides, sulphates, nitrates, carbonates of Ca and Mg, contributes to high salinity in water. BOD is measure of amount of oxygen consumed by micro-organism during decomposition of organic matter in water sample. In Jhajjar rivulet BOD at site 1 and site 2 has been found 6mg/l respectively whereas at site 3 it was 8mg/l, which indicates the presence of organic matter in water sample that causes depletion of dissolved oxygen in water and which

are dangerous for aquatic life. Highest level of BOD at sampling site-3 indicates that it was most polluted by organic effluent. COD determines the amount of oxygen required for chemical oxidation of organic matter using a strong chemical oxidant such as  $\text{K}_2\text{CrO}_4$  under reflux condition. In Jhajjar rivulet maximum COD recorded was 20 mg/l at Site 2 and site 3 as it receives higher pollution load of residential and commercial establishment in comparison to the site 1 where the COD recorded was 17mg/l. Dissolved oxygen (DO) value is a measure of degree of organic matter present in the water sample. The high DO value (9.0 mg/l) was found at sampling site 1 and site 2 whereas the lower DO value (7 mg/l) has been observed at site



3 where high effluent discharge was found. The addition of wastes produced by the manmade activities affect the quality of water like DO, BOD, COD, TDS, TSS etc., was reported by Yadav and Bhushan (2012) and Khanna and Bhutiani (2003). Kulkarni *et al.*, (2002) reported the similar study on Khushavati river. The multiple tube fermentation test allows for the detection and presence of coliforms in a water sample and estimation of the presence of their maximum probable number (MPN). In this investigation the MPN count found at Site-1, Site-2 and Site-3 was 6, 11 and 20 per 100 ml of sample respectively, which is within permissive limits.

### Conclusion

In the present investigation, water samples collected from the different sites of Jhajjar rivulet is evident in all physico-chemical, and microbiological parameters examined. It was observed that the water samples studied at site 1 are within the range of standard values prescribed by various agencies whereas there is a pollution load mostly at site 3 and slightly at site 2, it may be due to continuous dumping of municipal sewage, domestic waste, effluent, agricultural runoff and other man made activities in to the rivulet water. However the water samples studied from all the sites was found free from microbial contamination. It was concluded that water at site 1 is suitable for drinking purpose but the water at site 2 and site 3 is not satisfactory and is unsuitable for drinking purpose and other domestic uses. It is suggested that dumping of any type of the wastes without prior and proper treatment should be stopped.

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