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Research Article

Seasonal studies of some physical parameters and heavy metals present in River Dhamola at Saharanpur District(U.P) between 2013-2014

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ABSTRACT

River Dhamola at Saharanpur was analyzed for seasonal variation of physical parameters and total heavy metals. Three different sites (Near Numaish Camp Bridge (Sampling Sation A), Near Rakesh Cinema Bridge (Sampling Sation B), Near Vishwa Karma Chowk Bridge (Sampling Sation B)) were selected for water sampling seasonally for a period of one year (2013-2014). Samples were analyzed for various physical parameters viz. Temperature (°C), Turbidity (JTU), Total Solids (mg/l), Total Dissolved Solids (mg/l), Total Suspended Solids (mg/l), and Total Heavy Metals (mg/l). The less concentration of total heavy metals was observed at sampling station A, while at sampling station B and C greater concentration were observed.

Keywords: Water pollution, Physical Parameters, heavy metals, Water quality, River Dhamola.

INTRODUCTION

River serves as a basic source of water consumption for human beings. It supports human kind by providing water for irrigation, drinking, hydroelectric power projects, for defensive measure and also by supporting the aquatic life. River water is highly pure as it's not stagnant. But due to increase in population and pollution like disposal of sewage waste, textile effluents, garbage's etc., the level of purity has decreased as it is untreated. The physical and chemical characteristics of water are important parameters as it has a direct effect on suitability for the distribution and production of fish and other aquatic animals. Rivers help to determine the urban form of cities and neighborhoods and their corridors often present opportunities for urban renewal through the development of foreshore ways such as river walks.

Pollution in River Water

In most of the rivers the water is polluted naturally as well as through anthropogenic process. In natural process, water pollution is mainly caused by the decomposition of vegetables, animals and weather products. It affects the color, odor, and biological properties of water. In anthropogenic process, water pollution is caused by industrial, agricultural, domestic, radioactive, mining sources, use of fertilizer and pesticides by human being. These pollutants are regularly poured into water deterioration. These pollutants contain simple nutrients as well as heavy metals. In India all the rivers seems to be polluted. The major part of pollution is due to industrialization and domestic sewage as it contains a number of toxic chemicals and heavy metals. Water pollution of most rivers is due to millions of liter of sewage, domestic waste and industrial and agricultural effluents containing substances varying from simple nutrient such as total nitrogen, total phosphorus, etc to highly toxic substances such as total heavy metals

Study Area

The study area comprises of Saharanpur District of Uttar Pradesh State. Many agro based industries have been developing across the district Saharanpur. River Dhamola originates from Muzzafrabad, and then it goes to Saharanpur and mixed with river Pavdhoi. It is a tributary of river Hindon. In district Saharanpur rapid industrialization is taking place day by day, so most peaceful area is changing in industries and urbanization. Most drain of these industries carries effluents from factories and also from adjacent residential colonies with their domestic sewage which is finally poured into river Dhamola. Thus river water is polluted. As the river passes through Saharanpur its water turns brownish and blackish as small scale industrial effluents and house hold and municipal wastes are discharged in it. River Dhamola work confluence with Panvdhoi near Rakesh Cinema Theater and thereafter it continues up to Tapri and thereafter it confluence with Hindon river. It can be well thought that polluted river water carries a variety of pollutants of equally different physico-chemical nature which emerged as an idea and developed an interest to carry out the present work.

Water Sampling

Water samples were collected seasonally from different sampling stations i.e.

(A) Near Numaish Camp Bridge (Sampling Sation A)
(B) Near Rakesh Cinema Bridge (Sampling Sation B)
(C) Near Vishwa Karma Chowk Bridge (Sampling Sation C)

Studies were carried out during March 2013 to February 2014. The samples were taken in morning hours from 7.00 AM to 10.00 AM in borosil glass bottles of 300 ml, plastic cans of 1liter from each site.

MATERIALS AND METHODS

For physico-chemical study of river Dhamola the analysis of samples was done with the standard methods suggested by various researchers[1,2,3,4] was be followed. Some parameters like Temperature and pH analyzed at the site and other mentioned parameters as Turbidity, Total Solids, BOD, COD, DO and Total heavy metals were analyzed in the laboratory.

RESULTS AND DISCUSSION

The present study is devoted for evaluation of different physical and total heavy metals parameters of the river Dhamola of three various stations are given in Table 1, 2, 3. The seasonal average value of water temperature varied from 22.13 °C ±5.21 to 25.5 °C ±4.13. The temperature showed an upward trend from winter to summer season followed by downward trend from monsoon season onwards. More or less similar studies have been observed in the river Yamuna at Allahabad and in the Kallayani [5, 6]. Badola and Singh also reported similar trend in the river Alaknanda. Same study was made in river Ganga, Yamuna and Sangam at Allahabad, in river Song in eastern Doon, in river Ganga and in river Ganga at Rishikesh[8-12]. Same trend of temperature was observed by Khanna *et al.,* of various bathing Ghats of river Ganga at Bulandshahar and in river Panvdhoi at Saharanpur respectively[13, 4]. Dalal and his team Observed the similar trend in river Hindon at Ghaziabad[14]. Turbidity in water is caused by the substances not present in the form of true solution. Turbidity of water is actually the expression of optical property (Tyndall effect) in which the light is scattered by the particles present in the water. The seasonal average values of Turbidity in all three sampling stations varied between 381.33 JTU ± 62.14 and 1108.33 JTU± 233.57 in which maximum value at station C and minimum value at sampling station A. Same pattern was reported by many researchers also found similar trend in river Panvdhoi at Saharanpur[7,11,15,16,17]. Total Solids is the terms applied to material left in a beaker after evaporating a well mixed sample and subsequently evaporating and dried it in a oven. Seasonal Average Total solids were found maximum 2016.33 mg/l±744.56 at station C and minimum 948 mg/l ±240.13 sampling station A. Minimum average value of total solid during investigation found at sampling station A and maximum at sampling station C. Same conditions were shown **by teams lead by** Verma SR and Khanna in their studies[11,18]. Three research teams studied that most of the Indian River shows similar tendency with respect to fluctuation of total solids[19-21]. Khanna et al., also made out the same study and similar trends were shown during study of water quality of river Ganga at Haridwar[22,23]. Khanna and Dalal and also found similarpattern during the physico-chemical study of river Panvdhoi at Saharanpur and river Hindon at Ghaziabad respectively[17,14]. In the present study total heavy metals were taken for observations. The seasonal average value of total heavy metals range between14.89 mg/l ± 1.23 (at sampling station C) to 9.05 mg/l ± 0.95 (at sampling station A).Results obtained shows that heavy metal accumulation is more in downstream study siteC as compared to upstream study site A. (13,4) reported heavy metals in water of Ganga at Bulandshahar and river Panvdhoi at Saharanpur. (24) also reported heavy metals in river Ganga at Anupshahar. A similar study was carried by Andem et al.,2012 in which they have stated that the mean value of surface water temperature was 26.88±0.48C; water velocity, 0.24±0.07m/s; pH, 7.38±0.09; Total hardness, 109.96±9.06mg/L; Dissolved oxygen,

2.80±0.50mg/L; Biochemical oxygen demand , 405.57±59.47mg/L; Alkalinity, 77.5±5.94mg/L; Free carbon dioxide, 63.77±3.19mg/L; Conductivity, 288.76±11.00mg/L; Ammonium-nitrogen, 0.12±0.02mg/L; Total dissolved solids, 554.39±49.9mg/L; Total suspended solid, 1183.65±54.33mg/L. There were significant differences ($p<0.05$) in the mean values of dissolved oxygen, Biochemical oxygen demand and total dissolved solid with sampling stations. The physico-chemical parameters analysed during the study period showed that Ona river water was not fit for drinking when compared with the acceptable standards of Federal Ministry of Environment, Nigeria. Ravi Kumar Gangwar et al., 2012 stated that on monitoring of water of River Ramganga the temperature was found to be 20.4°C to 35.9°C, pH of river water ranged from 8.1 to 8.8, Total solids were ranged from 330 mg/l to 396 mg/l, Turbidity ranging between 22 to 72 NTU, Hardness of water was 192 to 219 mg/l, Alkalinity was 96 mg/l to 202 mg/l, organic pollution is mild as indicated by DO ranged from 5.8mg/l to 6.3 mg/l, BOD was 5.0 mg/l to 5.8 mg/l and COD was 33.5mg/l to 41 mg/l.

Table 1
Seasonal variation in physical parameters and total heavy metals of Dhamola river at Saharanpur at sampling station A (2013-2014)

Parameters	Summer	Monsoon	Winter	Average ± Sd
Temperature(°C)	24.2 ± 0.78	26.0 ± 0.45	16.2 ± 0.72	22.13 ± 5.21
Turbidity (JTU)	371 ± 5.1	448 ± 2.45	325 ± 5.2	381.33 ±62.14
Total Solids mg/l	907 ± 30.92	1206 ± 105.0	731 ± 56.15	948 ± 240.13
TDS (mg/l)	463 ± 25.10	523 ± 60.81	323 ± 34.15	436.33 ± 102.63
TSS (mg/l)	444 ± 22.21	683 ± 95.25	408 ± 50.15	511.66 ± 149.46
Total heavy metals (mg/l)	8.80 ± 0.62	10.10 ± 0.18	8.25 ± 0.25	9.05 ± 0.95

Table 2
Seasonal variation in physical parameters and total heavy metals of Dhamola river at Saharanpur at sampling station B (2013-2014)

Parameters	Summer	Monsoon	Winter	Average ± Sd
Temperature(°C)	26.3 ± 0.35	28.50 ± 0.48	19.5 ± 0.68	24.76 ± 4.69
Turbidity (JTU)	800 ± 6.8	995 ± 14.40	602 ± 8.72	799 ±196.50
Total Solids mg/l	1510 ± 8.92	2024 ± 215.0	956 ± 86.35	1496.67 ± 534.13
TDS (mg/l)	853 ± 45.31	926 ± 81.41	378 ± 28.85	719 ± 297.56
TSS (mg/l)	657 ± 58.11	1098 ±111.05	578 ± 82.39	777.66 ± 280.21
Total heavy metals (mg/l)	12.00 ± 0.72	13.0 ± 0.14	10.20 ± 0.34	11.73 ± 1.41

Table 3
Seasonal variation in physical parameters and total heavy metals of Dhamola river at Saharanpur at sampling station C (2013-2014)

Parameters	Summer	Monsoon	Winter	Average ± Sd
Temperature(°C)	26.5 ± 0.34	29.10 ± 0.65	21.0 ± 0.85	25.5 ± 4. 13
Turbidity (JTU)	1010 ± 2.1	1375 ± 2.86	940 ± 5.9	1108.33 ±233.57
Total Solids mg/l	2106 ± 23.12	2712 ± 126.01	1231 ± 36.26	2016.33 ± 744.56
TDS (mg/l)	1078 ± 23.15	1253 ± 68.31	515 ± 33.65	948.66 ± 385.62
TSS (mg/l)	1028 ± 24.81	1459 ± 90.95	716 ± 85.10	1067.66 ± 373.08
Total heavy metals (mg/l)	14.51 ± 0.29	16.27 ± 0.16	13.89 ± 0.34	14.89 ± 1.23

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