**Journal of Interdisciplinary and Multidisciplinary Research (JIMR)**
E-ISSN:1936-6264| Impact Factor: 8.886|
Vol. 18 Issue 07, July- 2023
Available online at: https://www.jimrjournal.com/
(An open access scholarly, peer-reviewed, interdisciplinary, monthly, and fully refereed journal.)

# Gomti River pollution due to municipal waste water at Sultanpur (U.P.)

**Hanumant Singh and P.K. Singh**

**Department of Chemistry**

**K.N.I.P.S.S., Sultanpur (U.P.)**

## Abstract

The present paper deals with physico-chemical parameters of municipal waste water released from Sultanpur municipal area of Uttar Pradesh. The overall analysis of collected municipal waste water samples has revealed the toxic nature. The water parameters analysed during the study were pH, temperature, alkalinity, dissolved oxygen, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), nitrate, phosphate, potassium, chloride, sodium, calcium and certain heavy metals. A significant variations in the various parameters were recorded at all the three sampling zones. The heavy metals like Cu, Cr, Zn, Co, Mn and Pb were recorded above the tolerance limit at all the sampling stations.

**Key-words :** Municipal water, Physico-chemical parameters, Gomti River, Sultanpur.

## Introduction

The Gomti river is tributrary of the river Ganga and also known as 'Adi Ganga'. According to the belief the river is the son of Rishi Vashishtha and bathing in the Gomti river on 'Ekadashi' can wash away sins. Gomti river flows in the Uttar Pradesh state. It originates from a small reservoir named as 'Gomat Tal' or Fulhaar Jheel, which is situated about 32 km east of the district 'Pilibhit' of Uttar Pradesh. The river Gomti merges into the river Ganga in between Varanasi and Gazipur (Mishra, 2014) near Saidpur Kaithi.

The river during its course, collects pollution of versatile nature from the inhabitations and other activities in the catchment. Although from the considerations of flow carries, the river states fifth in the state, but from the pollution consideration, it is first in the state. The dry weather flows in the river are so meagre in comparison to pollution loads that is become a source of greatest nuisance in high summers when there is maximum utilization of water by the population due to heat.

**Journal of Interdisciplinary and Multidisciplinary Research (JIMR)**
E-ISSN:1936-6264| Impact Factor: 8.886|
Vol. 18 Issue 07, July- 2023
Available online at: https://www.jimrjournal.com/
(An open access scholarly, peer-reviewed, interdisciplinary, monthly, and fully refereed journal.)

Water which is a life supporting natural resource is now being contaminated by alterations in physico-chemical properties due to discharge of untreated municipal effluents and agricultural run-off. This contamination leads to health hazards besides creating serious problems for sources of drinking and irrigation water supplies. Particularly, the municipal effluent is being used in agricultural practices since decades ago to achieve higher yields. In city areas both domestic and municipal waste water, are in general hold nutrient-rich properties. Although the municipal effluent and its sludge add valuable nutrients and improve the taxture of soil but, several studies showed that they leave heavy metals like Cu, Pb, Cr etc. to the environment (Pandey *et al.,* 2001).

Keeping this in view, the physico-chemical analysis of untreated municipal effluent of Sultanpur city were analysed for one year at three sampling stations during 2022.

## Materials and Methods

Samples of three discharge zones were collected at monthly intervals in the first week of the month from Oct. 2021 to Sept. 2022, between 8 a.m. to 11 a.m. Water samples were collected in three replicates from each of the zone in clean plastic containers, using standard methods of collection (APHA, 1999). Municipal waste water samples were brought to the laboratory and kept in preservater at $4^0$C for further analysis of various physico-chemical variables i.e. alkalinity, DO, BOD, COD, nitrate, phosphate, potassium, chloride, sodium and calcium. The temperature and pH were analysed at the sampling sites using stadnard methods for the analysis of water and waste water APHA, AWWA, WPCF (1999). For the analysis of heavy metals, the Atomic Absorption Spectroscopy method was used, because it is most widely used method for heavy metal analysis.

## Result and Discussion

The physico-chemical properties of collected municipal waste water samples and heavy metals concentrations were analysed for a year and the mean values are presented in the Table (1) and (2). The range values of various parameters recorded were pH (8.5-8.7), temperature (22.5-27.3$^0$C), alkalinity (378-472 mg/l), DO (3.4-4.5 mg/l), BOD (21-171 mg/l), COD (56-241 mg/l), nitrate (0.164-0.848 mg/l), phosphate (0.165-0.997 mg/l), sodium (11.6-25 mg/l) and

**Journal of Interdisciplinary and Multidisciplinary Research (JIMR)**
E-ISSN:1936-6264| Impact Factor: 8.886|
Vol. 18 Issue 07, July- 2023
Available online at: https://www.jimrjournal.com/
(An open access scholarly, peer-reviewed, interdisciplinary, monthly, and fully refereed journal.)

calcium (0.251-1.80 mg/l). Except sodium, all other values of physico-chemical variables were analysed minimum at zone-I and maximum at zone-III (Table-1).

The heavy metal concentration in collected water samples varied at different zones with the different collection time (Table-2). The concentration of heavy metals was found to be maximum at site-III and minimum at site-I followed by site-II throughout the study period.

In the present study, overall pH value was found in alkaline range, might be due to little chance of dilution of waste water (Singh and Pande, 1995). The variation in DO value at various points was in accordance with the variation in the quality and quantity of municipal and domestic wastes discharged at those points (Kakti and Bhatacharya, 1990). BOD and COD values of municipal water of Sultanpur city revealed that there is negative relationship between BOD and DO (Pande and Singh, 1995).

**Table-1 : Physico-chemical characteristics of waste water of Sultanpur Municipal area**
(Mean value of 12 months)

| S.N. | Variables | Sampling Sites | | |
|---|---|---|---|---|
| | | Zone-I | Zone-II | Zone-III |
| 1. | pH | 8.5 ± 0.62 | 8.7 ± 0.87 | 8.7 ± 0.68 |
| 2. | Temperature $^0$C | 22.5 ± 1.31 | 26.7± 1.06 | 27.4 ± 2.10 |
| 3. | Alkalinity | 378 ± 46.10 | 462.2 ±61.20 | 472 ± 59.70 |
| 4. | Dissolved Oxygen | 3.3±0.81 | 3.9±0.34 | 4.5 ± 0.56 |
| 5. | ($20^0$C, 5 days) BOD | 21 ± 1.71 | 155 ± 20.0 | 171 ± 22.00 |
| 6. | COD | 56 ± 2.30 | 210 ± 11.01 | 241 ± 8.70 |
| 7. | Nitrate | 0.164 ± 0.067 | 0.628 ± 0.081 | 0.848 ±0.101 |
| 8. | Phosphate | 0.165 ± 0.021 | 0.235 ± 0.012 | 0.997± 0.131 |
| 9. | Potassium | 0.178 ± 0.05 | 0.523 ± 0.10 | 0.70 ± 0.102 |
| 10. | Chloride | 17 ± 0.981 | 37 ± 2.01 | 57 ± 2.00 |
| 11. | Sodium | 11.6 ± 0.86 | 25 ± 1.05 | 22 ± 3.01 |
| 12. | Calcium | 0.251 ± 0.01 | 0.768 ± 0.067 | 01.80 ±0.181 |

- ± Standard error
- All values in mg/l eccept pH and temperature.

**Journal of Interdisciplinary and Multidisciplinary Research (JIMR)**
E-ISSN:1936-6264| Impact Factor: 8.886|
Vol. 18 Issue 07, July- 2023
Available online at: https://www.jimrjournal.com/
(An open access scholarly, peer-reviewed, interdisciplinary, monthly, and fully refereed journal.)

**Table-2 : Heavy metal analysis of waste water of Sultanpur Municipal area**
(Mean values of 12 months in µg/l)

| S.N. | Heavy Metal Concentration | Sampling Sites | | |
|---|---|---|---|---|
| | | Zone-I | Zone-II | Zone-III |
| 1. | Cu | 5 ± 1.05 | 38 ± 2.47 | 1.6 ± 4.58 |
| 2. | Cr | 11 ± 1.62 | 18 ± 1.30 | 51 ± 2.81 |
| 3. | Zn | 7 ± 0.89 | 5 ± 1.01 | 88 ± 2.19 |
| 4. | Co | 3 ± 0.58 | 24 ± 2.16 | 52 ± 1.67 |
| 5. | Mn | 22 ± 2.35 | 58 ± 2.37 | 121 ± 5.88 |
| 6. | Pb | 16 ± 1.01 | 76 ± 1.85 | 68 ± 3.06 |

- ± Standard error

The alkalinity value was higher in summer months and lower in winter almost all the sampling stations. The amount of phosphate also had higher value might be due to discharge of detergents from households of entire municipal area. Calcium and chloride contents was recorded maximum in winter followed by rains and minimum in summer months. Their contents were increased with increase in water pollution load. Similar condition was also observed with nitrate contents (Trivedi and Goel, 1984).

The sources of heavy metals present in the municipal waste waters are household activities, human faeces, ancillary and small industrial units such as automobile repair shops, electroplating units etc. These are also present in fuels, pesticides, inks, lubricants, paints, pigments and preservatives etc. and therefore, it is expected that these metals appear in relatively higher concentrations in the municipal waste waters.

In recent years, because of continuous growth in population, rapid industrialization and sewage disposal, the rate of discharge of pollutants into the Gomti river water might be for higher than the rate of their purifications (Mishra, 2014).

From the above discussions it appears that the major municipal drains of Sultanpur city carry highly polluted water. This is responsible for the decline of water quality of fresh water bodies of the municipal area to which all the drains flow.

## Conclusion

The present study carried out in the Sultanpur city area to evaluate water pollution load of Gomti river due to municipal waste water discharged into the river. The result revealed that the physico-chemical nature of municipal waste water of Sultanpur city area when released into the fresh water of the river Gomti may cause high water pollution due to toxic nature of the municipal effluents. Therefore to protect the river environment prior to discharge of municipal effluent, its proper treatment is needed.

## Acknowledgement

The author is thankful to the Principal and Head of the Chemistry department, K.N.I.P.S.S. Sultanpur (U.P.) for providing necessary laboratory and library facilities during the course of present investigation.

## References

APHA (American Public Health Association), AWWA (American Water Works Association) and WPCF (Water Pollution Control Federation) (1999). Standard methods for the examination of water and waste water (20th Ed.), Washington, D.C.

Kakti, G.N. and K.G. Bhatacharya (1990). Physico-chemical characterstics of the municipal waste water of Guhati. *Ind. J. Env. Prot.*, 10(9) : 690-694.

Mishra, S.P. (2014). Analysis of Water quality of Gomti river at district Sultanpur (U.P.). *IJESIRD* I (III) : 113-115.

Pandey, G.C., S. Neraliya, P.K. Srivastava and G. Tripathi (2001). In : Current topics in Environmental Sciences, pp 347-366 (Eds. Trivedi & Pandey), A.B.D. Publishers, Jaipur, India.

Singh, G. and Y.N. Pande (1995). Physico-Chemical characteristics of the municipal waste water of Faizabad. *J. Liv. World*, 2(2) : 62-68.

Trivedy, R.K. and P.K. Goel (1984). Some considerations on sewage disposal to Fresh Waters and resultant effects. *J. Poll. Res.*, 3(1) : 07-12.