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# Impact of Ami River on Rapti River Water Quality

Ayush Kumar Rai
(Department of Civil Engineering, MMMUT, Gorakhpur, UP)

**ABSTRACT**
Ami river is highly polluted as compare to Rapti river .The impact of water of river Ami on ground water quality of river Rapti abstracted through shallow and deep hand pumps placed in close vicinity of river Ami and river Rapti .There was three stations selected for the study i.e. Malav. Sohagaura and Kauriram . The ground water samples were analyzed in terms of physical, chemical, bacteriological properties of water quality parameters. The parameters which were analyzed i.e. pH, temperature, acidity, alkalinity, chlorides, total hardness, TDS, turbidity and MPN, for the period of four months (January, February, March, and April). After that it was found that river Ami is highly polluted, which affect the ground water of river Rapti and the obtained result were also compare with Indian Standard Drinking Water specification IS: 10500-2012.
***Keywords*** **-** pH, TDS, MPN, IS: 10500:2012

## I. Introduction

Water is necessary for all forms of life, either human beings or plants or animals. And the water may be either surface water or ground water. But, by increasing population of country and industrializations, the water qualities are affected now a day. The polluted water is affected the public heath and aquatic ecosystems.

Ami River is a meandering river which originates from Sohanara (dumriyaganj) which travels 126 kilometers, and finally it drains into Rapti River at Sohagaura near Kauriram in Gorakhpur district. It serves as a lifeline for the people of Siddhartha Nagar, Sant Kabir Nagar, Basti and Gorakhpur district in Utter Pradesh. And it is polluted by various industrial effluent, Sugar Mill effluent, Paper mill effluent, and agricultural products.

Rapti river, originally Irawati and then corrupted as Ravati. After traveling Gonda, Bahraich and Basti , it enters Gorakhpur district of Utter Pradesh between Talhatwa and Bersar for few kilometers. It again travels from Rigauli to Juinaraynpur in eastern Utter Pradesh. Then it touches Gorakhpur city and again flow in south-east. Then it travels near 30 or 35 kilometers. After traveling, it meet to Ami River at Sahagaura and again it flow and meet Ghaghra River at Kaparwar Ghat after traveling some kilometers.

In this study, the water quality parameters of physical, chemical and biological characteristics of this ground water quality parameters from shallow depth and pumps and Indian Mark- hand pumps were studies in Kauriram (before meeting Rapti River), Malav ( before meeting Ami River) and Sohagaura (after meeting Ami river and Rapti River).

## II. Selection of Sampling Stations

For considered all things, three sampling stations were selected for this study.

1- Malav (S1) - Before meeting Ami River.
2- Kauriram (S2) - Before meeting Rapti River.
3- Sohagaura (S3) – After meeting Ami and Rapti River.

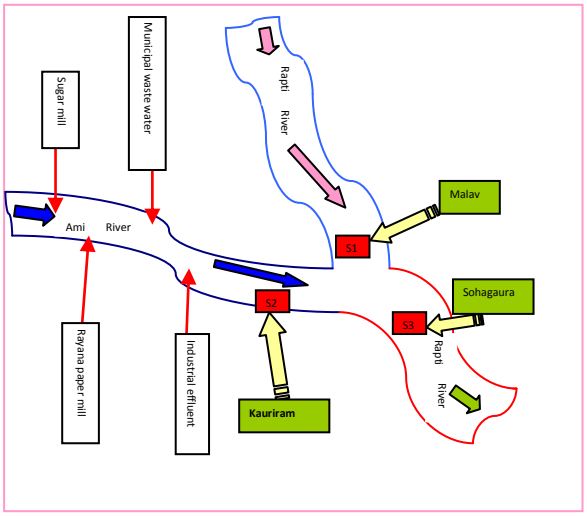


Fig-1 (Location of Sampling Stations) - Not to scale

## III. Materials and Methods

The water samples were taken from groundwater sources and tested in Environmental Engineering Laboratory of Madan Mohan Malaviya University of Technology, Gorakhpur for physical, chemical, and biological characteristics.

The samples were collected in two liters sterilized polyethylene bottles. The analysis was carried out in accordance with standard procedure. The obtained result were showing the Ami River is highly effected by various physical, chemical and

biological characteristics of ground water as compare to ground water quality of Rapti River. The samples were analyzed for physico-chemical and biological parameters i.e. pH (Universal indicator), turbidity (Nephelometric Method), TDS (Digital meter), chloride (Argentrometric method), hardness (EDTA method), alkalinity, acidity, MPN (Multiple dilution Method).

## IV. Results and Discussion

The data collected by analyzed the samples from the all three stations and for duration of four months i.e. January, February, March, April, which are discuss here-

Table- 1
Results of ground water quality in January Month

| S.N. | Parameters | Hand pumps type | Station (S1) | Station (S2) | Station (S3) |
|---|---|---|---|---|---|
| 1. | pH | S.H.P. | 6.5 | 7.5 | 7.5 |
| | | I.M.H.P. | 7.0 | 7.5 | 8.0 |
| 2. | Turbidity (NTU) | S.H.P. | 1.1 | 4.2 | 2.4 |
| | | I.M.H.P. | 0.8 | 2.1 | 1.2 |
| 3. | D.O. (mg/l) | S.H.P. | 7.2 | 9.3 | 12.8 |
| | | I.M.H.P. | 8.6 | 6.8 | 09.5 |
| 4. | TDS (mg/l) | S.H.P. | 260 | 136 | 268 |
| | | I.M.H.P. | 262 | 207 | 556 |
| 5. | Hardness (mg/l) | S.H.P. | 275 | 747 | 270 |
| | | I.M.H.P. | 318 | 330 | 381 |
| 6. | Chloride (mg/l) | S.H.P. | 17 | 25 | 17 |
| | | I.M.H.P. | 19 | 44 | 95 |
| 7. | Alkalinity (mg/l) | S.H.P. | 282 | 468 | 283 |
| | | I.M.H.P. | 289 | 273 | 369 |
| 8. | Acidity (mg/l) | S.H.P. | 25 | 77 | 58 |
| | | I.M.H.P. | 49 | 43 | 54 |
| 9. | MPN (Coli form /100 ml) | S.H.P. | 460 | 2400+ | 2400+ |
| | | I.M.H.P. | 210 | 2400+ | 2400+ |

(S.H.P.- Shallow depth hand pumps, I.M.H.P – Indian mark-2 hand pumps, DO- Dissolved solid, TDS-Total dissolved solid, MPN-Most probable number).

Table- 2
Results of ground water quality in February Month

| S.N. | Parameters | Hand pumps type | Station (S1) | Station (S2) | Station (S3) |
|---|---|---|---|---|---|
| 1. | pH | S.H.P. | 7.0 | 8.5 | 8.5 |
| | | I.M.H.P. | 7.5 | 6.5 | 7.5 |
| 2. | Turbidity (NTU) | S.H.P. | 1.5 | 5.2 | 3.1 |
| | | I.M.H.P. | 1.2 | 3.2 | 1.4 |
| 3. | D.O. (mg/l) | S.H.P. | 6.8 | 5.8 | 8.2 |
| | | I.M.H.P. | 10.2 | 8.1 | 9.4 |
| 4. | TDS (mg/l) | S.H.P. | 232 | 297 | 321 |
| | | I.M.H.P. | 277 | 397 | 507 |
| 5. | Hardness (mg/l) | S.H.P. | 290 | 697 | 340 |
| | | I.M.H.P. | 291 | 312 | 318 |
| 6. | Chloride (mg/l) | S.H.P. | 20 | 34 | 42 |
| | | I.M.H.P. | 22 | 39 | 82 |
| 7. | Alkalinity (mg/l) | S.H.P. | 301 | 321 | 397 |
| | | I.M.H.P. | 203 | 256 | 289 |
| 8. | Acidity (mg/l) | S.H.P. | 29 | 59 | 72 |
| | | I.M.H.P. | 51 | 38 | 64 |
| 9. | MPN (Coli form /100 ml) | S.H.P. | 460 | 2400+ | 2400+ |

Table- 3
Ground water quality in March Month

| S.N. | Parameters | Hand pumps type | Station (S1) | Station (S2) | Station (S3) |
|---|---|---|---|---|---|
| 1. | pH | S.H.P. | 6.5 | 8.5 | 6.5 |
| | | I.M.H.P. | 7.0 | 6.5 | 8.0 |
| 2. | Turbidity (NTU) | S.H.P. | 2.6 | 4.1 | 3.7 |
| | | I.M.H.P. | 1.1 | 1.2 | 1.6 |
| 3. | D.O. (mg/l) | S.H.P. | 5.9 | 5.3 | 6.6 |
| | | I.M.H.P. | 8.3 | 9.1 | 8.4 |
| 4. | TDS (mg/l) | S.H.P. | 346 | 299 | 457 |
| | | I.M.H.P. | 240 | 409 | 486 |
| 5. | Hardness (mg/l) | S.H.P. | 321 | 397 | 460 |
| | | I.M.H.P. | 302 | 309 | 357 |
| 6. | Chloride (mg/l) | S.H.P. | 17 | 27 | 35 |
| | | I.M.H.P. | 19 | 31 | 28 |
| 7. | Alkalinity (mg/l) | S.H.P. | 220 | 322 | 318 |
| | | I.M.H.P. | 284 | 259 | 260 |
| 8. | Acidity (mg/l) | S.H.P. | 37 | 49 | 67 |
| | | I.M.H.P. | 48 | 67 | 75 |
| 9. | MPN (Coliform /100 ml) | S.H.P. | 290 | 2400 + | 2400 + |
| | | I.M.H.P. | 290 | 2400 + | 1100 |

Table- 4
Results of ground water quality in April Month

| S.N. | Parameters | Hand pumps type | Station (S1) | Station (S2) | Station (S3) |
|---|---|---|---|---|---|
| 1. | pH | S.H.P. | 7.5 | 7.5 | 7.5 |
| | | I.M.H.P. | 8.0 | 8.5 | 8.5 |
| 2. | Turbidity (NTU) | S.H.P. | 2.1 | 3.9 | 2.6 |
| | | I.M.H.P. | 1.1 | 2.3 | 1.6 |
| 3. | D.O. (mg/l) | S.H.P. | 6.8 | 5.1 | 6.2 |
| | | I.M.H.P. | 7.4 | 6.7 | 7.1 |
| 4. | TDS (mg/l) | S.H.P. | 253 | 417 | 272 |
| | | I.M.H.P. | 266 | 272 | 578 |
| 5. | Hardness (mg/l) | S.H.P. | 473 | 520 | 322 |
| | | I.M.H.P. | 371 | 322 | 586 |
| 6. | Chloride (mg/l) | S.H.P. | 10 | 49 | 15 |
| | | I.M.H.P. | 13 | 15 | 86 |
| 7. | Alkalinity (mg/l) | S.H.P. | 210 | 221 | 388 |
| | | I.M.H.P. | 269 | 388 | 232 |
| 8. | Acidity (mg/l) | S.H.P. | 44 | 62 | 52 |
| | | I.M.H.P. | 62 | 59 | 64 |
| 9. | MPN (Coliform /100 ml) | S.H.P. | 460 | 2400 + | 2400 + |
| | | I.M.H.P. | 150 | 1100 | 1100 |

The ground water quality parameters were found in January, February, March and April months show in above table. It was found in January month, that the ground water of Rapti River (S1) having pH value 6.5 by shallow depth hand pump and 7.0 by

Indian mark-2 hand pump but when, it meets to Ami river (S2, having pH value 7.5 by shallow depth hand pump and 7.5 by Indian mark-2 hand pump), the pH value of Ami and Rapti River (after meet i.e. S3) were 7.5 by shallow depth hand pump and 8.0 by Indian mark-2 hand pump. In February months, the ground water of Rapti River (S1) having pH value 7.0 by shallow hand pump and 7.5 by Indian mark-2 hand pump. But when, it meets to Ami River (i.e.S2,pH value 8.5 by shallow hand pump and 6.5 by Indian mark-2 hand pump) the pH value of station (S3) were 8.5 by shallow depth hand pump and 7.5 by Indian mark-2 hand pump. In March month, the station (S1) having pH Value 6.5 by shallow depth hand pump and 7.0 by Indian mark-2 hand pump. But at station (S2), it was found 8.5 by shallow depth hand pump and 6.5 by Indian mark-2 hand pump. And after meeting the Ami and Rapti River, the pH value changed from 7.5 to 8.0 but the value of p H was remain same i.e. 6.0 to 6.0. And in last month of this program i.e. April, the ground water of station (S1) having pH value of 7.5 by shallow depth hand pump and 8.0 by Indian mark-2 hand pump. At station (S2), the pH value was 7.5 by shallow depth hand pump and 8.5 by Indian mark-2 hand pump. But at station (S3), the pH value of Rapti River was observed 7.5 by shallow depth hand pump and 8.5 by Indian mark-2 hand pump. It has observed that pH of Ami river effect the ground water of Rapti River. And it observed that the other parameters of ground water i.e. Turbidity, DO, TDS, Hardness, Chloride, Alkalinity, acidity and MPN were also impact the ground water of Ami River on ground water of Rapti River in January, February, March and April months.

The maximum and minimum observed data of ground water quality at station (S1), station (S2) and station (S3) are shown in table 5.

Table – 5
Maximum and Minimum values of different Water Quality Parameters of Station (S1), (S2) and (S3)-

| 4 | Parameters | Station (S1) | | Station (S2) | | Station (S3) | | Permissible Value as per IS: 10500-2012 |
|---|---|---|---|---|---|---|---|---|
| | | MMaximum | Minimum | Maximum | Minimum | Maximum | Minimum | |
| 1. | pH | 8.0 | 6.5 | 8.5 | 6.5 | 8.5 | 6.5 | 6.5-8.5 |
| 2 | Turbidity (NTU) | 2.6 | 0.8 | 5.2 | 1.2 | 3.7 | 1.2 | 5 |
| 3. | DO (mg/l) | 10.2 | 5.9 | 9.3 | 5.1 | 12.8 | 6.2 | ------ |
| 4. | TDS (mg/l) | 346 | 232 | 417 | 136 | 578 | 268 | 2000 |
| 5. | Hardness (mg/l) | 473 | 275 | 747 | 309 | 586 | 270 | 600 |
| 6. | Chloride (mg/l) | 22 | 10 | 49 | 15 | 95 | 15 | 1000 |
| 7. | Alkalinity (mg/l) | 301 | 203 | 468 | 221 | 397 | 232 | 600 |
| 8. | Acidity (mg/l) | 62 | 25 | 77 | 38 | 75 | 52 | ------ |
| 9. | MPN (Coliform /100 ml) | 150 | 460 | 2400+ | 1100 | 2400+ | 1100 | Shall not be detectable in any 100 ml sm |

## V. Conclusions and Recommendation

The contamination of groundwater has emerged as one of most problems being faced by Public Health Engineering Department, in particular and public at large which are living near this area. It found that, the ground water of Ami river affect the ground water quality of Rapti River either it is pH or other ground water quality parameters (i.e. alkalinity, acidity, MPN or hardness).The ground water of Ami River contaminated by various mills, industries and markets.

After comparing the above data to IS: 10500-2012, it found that the water of station (2) was not safe for drink. Because station (2) had more value as

compare to permissible value of IS: 10500-2012.It also found that, the turbidity of station (2) had more value as compare to permissible value of IS: 10500-2012. And, I would like to tell that, the water quality parameter of shallow depth hand pumps are highly contaminated as compare to Indian mark-2 hand pumps. And the station (S2) much contaminated as compare to station (S1) and (S3). The water of station (S2) was not safe for drinking purpose. There should be an initiative taken for water quality assessment by local and central regulatory bodies to improve the action for impact of Ami River on ground water quality of Rapti River. And there is a need to conduct the big surveys in order to ensure the sustainable development of water quality.

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