e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:12/December-2022 Impact Factor- 6.752 www.irjmets.com

A STUDY OF WATER QUALITY OF SANGAM ALLAHABAD AT DIFFERENT STREAM LEVEL DURING MONSOON

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DOI : https://www.doi.org/10.56726/IRJMETS32304

ABSTRACT

In this research work discusses the water situation at the Sangam in Allahabad district of Uttar Pradesh State in India. The place is a sacred holy place that is home to the famous Kumbh Mela, held every twelve years. The place is famous for the Triveni Sangam made by the three oldest rivers of India, Ganga, Yamuna, and Sarawati. Despite being a holy place, the water quality of the stretch of river is not good for consumption purposes. Therefore, a study has been done on the water quality of the river. Six samples have been taken from three sampling sites viz: Dara Ganj ghat(S1), Sangam mid (S2), Arail ghat (S3) from pre-monsoon to during monsoon, during May 2022 to Aug 2022 at an interval of 15 days at the different ghats and stretches of the river in the Prayagraj. Ten parameters were selected namely-Temperature, ph, hardness, alkalinity, BOD, DO, Turbidity, electrical conductivity, chloride content, and TDS.The values were compared with standard values recommended by CPCB. The tests were conducted to determine the physical and chemical properties of the water present in that stretch as the inflow of organic pollution have been attributed to inputs from flood. According to the results obtained by analyzing the physical-chemical parameters that during pre-monsoon and during monsoon the values of some parameters were high specially during monsoon which makes the water quality unfit for various purposes. So, regular monitoring of the river at different ghats is quintessential.

Keywords: Triveni Sangam, Allahabad, Rivers, Weather.

I. INTRODUCTION

History of Allahabad

Prayagraj is one of the oldest cities in India. It is considered the holiest pilgrimage site in India and is called "Prayag" or "Ti Taraj" in ancient texts. Its area is 5,482 square kilometers and according to the latest census, it has a population of 5,954,000, of which 3,132,000 are men and 2,823,000 are women. There are a total of 3178 villages in this city. One of the major cities of Uttar Pradesh, Prayagraj is located at the confluence of three rivers: the Ganges, the Yamuna, and the spiritual Saraswati. The meeting place of Triveni is especially revered by Hindus. Formerly known as Prayag, this city was the site of one of the earliest Aryan settlements."Prayagasya Praveshshu Papam Nashwati Tatkshanam" All Sins Are Cleaned With An Entry In Prayag. One of the ancient and legendary cities of India, Prayagraj has a rich history and present. It is a city with a diverse population of Christians, Muslims, Jains, and Hindus.The mentions in the Puranas, Ramayana, and Mahabharata indicate its sanctity.

Prayagraj is primarily an administrative and educational city. Uttar Pradesh High Court, Audit Board, Defense Accounts Office (Pensions) PCDA, Uttar Pradesh Madimik Shiksha Parishad (UP BOARD), Police Headquarters, and Moti Lal Nehru Regional College of Engineering are all located within the state. Prominent industries in this area include Triveni Glass, MNREC College, College of Medicine and Agriculture, Indian Institute of Information Technology (IIIT), ITI Naini, and IIFCO Phulpur. Prayagraj has always been the center of research, knowledge, and writing. It is India's most prosperous, politically aware, spiritually aware, and intellectual city.

Rivers in India

Ganga River

On the Indian side of the border with the Tibet Autonomous Region of China, the Ganges River originates south of the Great Himalayas. The five headwaters of the Bhagirathi, Alkananda, Mandakini, Dhauliganga, and Pindal rivers originate in the Himalayan region of northern Uttarakhand. Hindu pilgrims revere Gangotri as a holy place. However, Gomuk, located about 21 km (13 mi) southeast of Gangotri, is said to be the actual source of the Ganges. Emerging from the mountains near Rishikesh, the main Ganges flows through the confluence of the

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Alaknanda and Bhagirathi rivers at Devprayag. The Ganges flows through the Siwalik Mountain range (Outer Himalayas) in the southwest. Then drive through the plains of Haridwar, another Hindu holy site. The flow of the Ganges has distinct seasonal changes and its volume increases significantly as it acquires additional tributaries and enters high-rainfall areas. The river is fed by Himalayan snowmelt from April to June and flowed by wet monsoons from July to September. River flow decreases during winter.

Yamuna River

One of the most beautiful rivers in India is the Yamuna River. The Yamunotri glacier with a height of 6387 meters, which is located southwest of the Banderpooch peak at the bottom of the Himalayas, is the source of a famous river. The river has a catchment area of 366,223 square kilometers and a total length of 1,376 kilometers (855 miles). This area constitutes 40.2% of the Ganges watershed before the confluence of the Ganges and Triveni Sangam at Allahabad. Most importantly, it creates a very fertile Yamuna-Ganges-Doab region between the Ganges River and itself in the Indo-Gangetic terrane. About 57 million people depend on Yamuna water. The river supplies about 70% of Delhi's water needs with an annual displacement of over 10,000 cubic meters and 4,400 cum of consumption (96% of which is for agriculture). Like the Ganga, the Yamuna is highly revered among Hindus and is considered a Yamuna goddess during her period. The Yamuna is said to be the daughter of Yama, the god of death, and Yami, the sister of the sun god Surya.

Triveni Sangam

Ganga, Yamuna and Sarasvati rivers meet at Triveni Sangam in Allahabad. One of these three rivers, the Sarasvati River, is said to flow underground and join the other two rivers from below. The murky, bright yellow water of the Ganges meets the azure waters of the Yamuna here. Near the Nexus, the Yamuna and Ganges rivers occasionally meet at depths of 40 and 4 feet respectively. At this point, the Yamuna joins the Ganges and continues until it joins the sea at the Bay of Bengal. From the platform built at the Sangam at the confluence of India's two great rivers, where the unseen Sarasvati meets, scores of Tirtha Yatris board boats and bathe. It beautifies the river with migratory birds during the Kumbh Mela in January. It is said that all the gods bathe in Sangam and appear as humans to atone for their sins. Devout Hindus from all over India visit this holy place to perform pilgrimages and immerse themselves in the mystical waters. Every 12 years, the Kumbh Mela is held here.

II. OBJECTIVES

- To understand the level of pollution in the sangam Allahabad during Monsoon.
- To analysis the physical or chemical parameters of sangam.
- To study and to compare the physical or chemical properties with the CPCB limit.

III. METHODOLOGY

In this chapter finalize the working procedure for analysis. For study choose sangam RiverWater Quality located in Allahabad at Different Stream Level during Monsoon. Water Samples are collected from different level of stream at different time. The major target of study is effect on water quality parameters due to flood condition.

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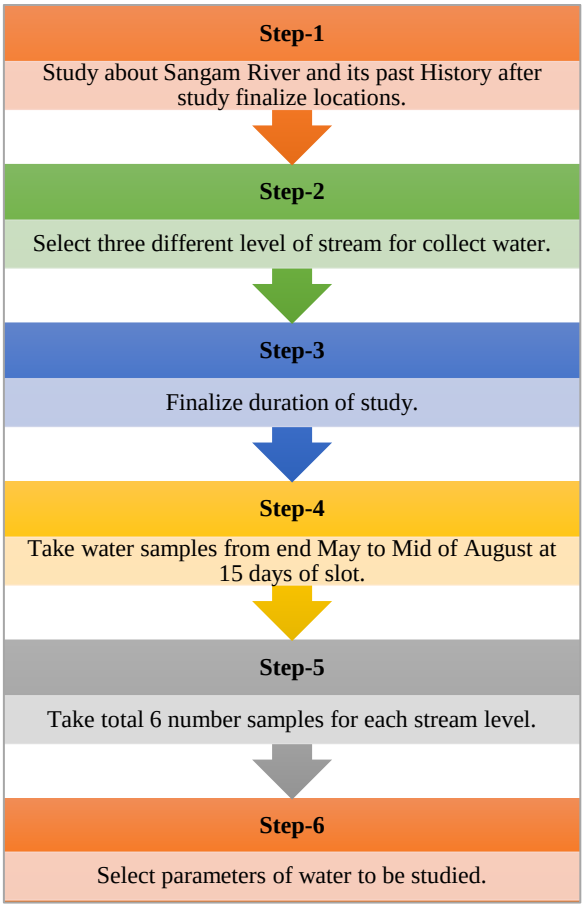

Fig 3.1: Working Process

3.1 Site Description

Prayagraj is located in the southern part of the Utter Pradesh, at latitude and longitude coordination are 25° 28'N, 81° 52'Emit is an ancient and unique city in India where found big river of the world namely Ganga and Yamuna meet at this place called "TRIVENI SANGAM".

Kumbh mela and Megh mela celebrated on the bank of sangam in this research on the attempt has been made to analyze the physio-chemical changes within 15days interial from last May to August in three different sampling sites.

- At Daraganj Ghat
- At Sangam Mid
- At Arail Ghat

3.2 Collection of samples

For collection of water sterilized bottles was used, bottle was washed toughly and rinsed by distilled water, for microbial analyze each day bottle was rinsed with 0.5ml sodium thiosulphate (10% solution) water sampling was collected from a depth of 30-40cm by lowering pre-cleaned plastic bottle into the river waste collected in the air tight bottles were stored in the icebox to retard the biochemical actives.

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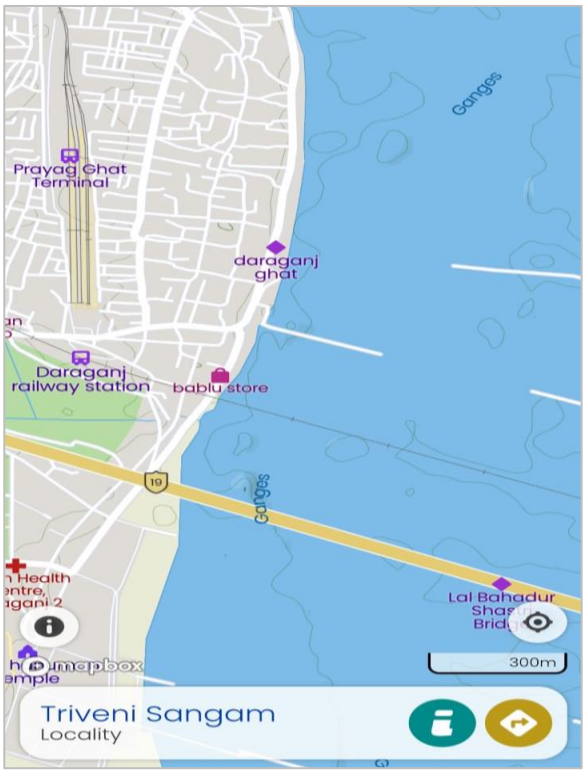

Fig 3.2: Site-1 Daraganj Ghat Up-stream (6.1 km)

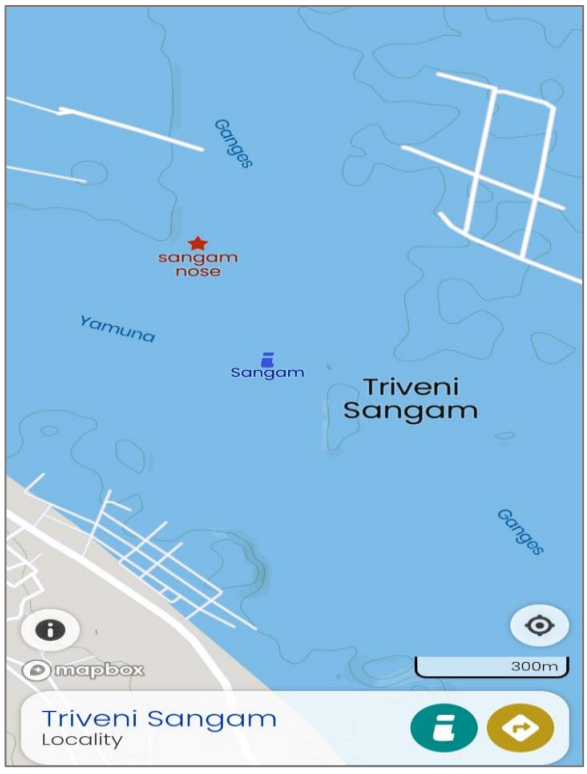

Fig 3.3: Site-2 Sangam river Mid-stream (7.5 km)

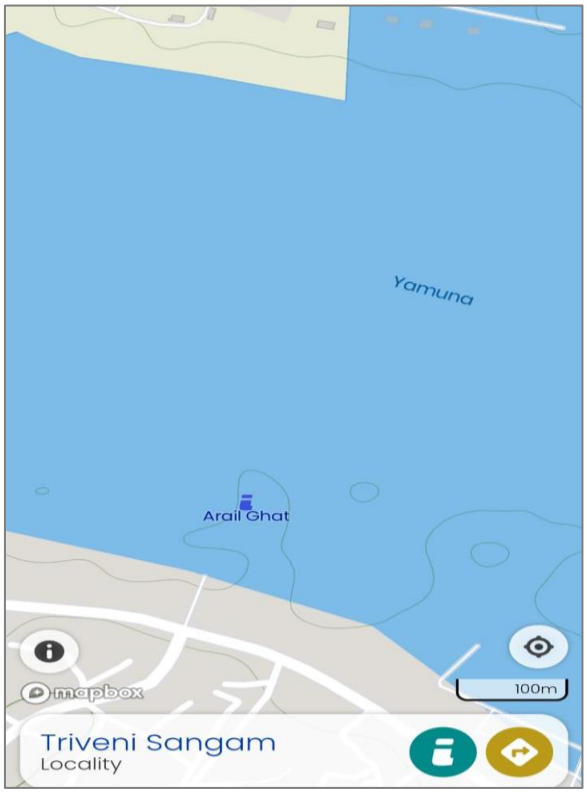

Fig 3.4: Site-3 Arial Ghat Down-stream (6.2 km)

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IV. ANALYSIS

Table 4.1: Parameters Used for Water Samples Testing

No. of Test	Name of Conducted Tests	Experiment
1.	Temperature of water Sample	Using Digital Thermometer
2.	pH of water Sample	electrometric method
3.	Turbidity of water Sample	Digital turbidity meter
4.	Conductivity of water Sample	Digital Conductivity meter
5.	Dissolved Oxygen of water Sample	electrometric method
6.	Total Dissolved Solids of water Sample	Digital TDS meter
7.	Hardness of water Sample	(EDTA) method
8.	Biological Oxygen Demand of water Sample	5-day incubation
9.	Chloride Content of water Sample	potentiometric titration
10.	Alkalinity	Titration method

V. RESULT AND DISCUSSION

In this Section studied about Concluded Results from water samples that were collected from river sangam. Located in up-stream, Down-stream and mid-stream in different months' time period.

Results for water samples test:

Table 5.1: Test Data of Water Samples Analysis Done for Temperature (°C)

Temperature (°C) Test				
S. No.	**Collection Time**	**Up-Stream**	**Mid-Stream**	**Down-Stream**
1	Last of May	27.58	24.12	28.39
2	June Mid	29.32	27.85	32.26
3	Last of June	26.71	22.61	23.24
4	July Mid	27.89	26.11	25.03
5	Last of July	29.85	28.36	27.59
6	Aug Mid	31.13	29.24	29.01
7.	Average time	28.75	26.38	27.59

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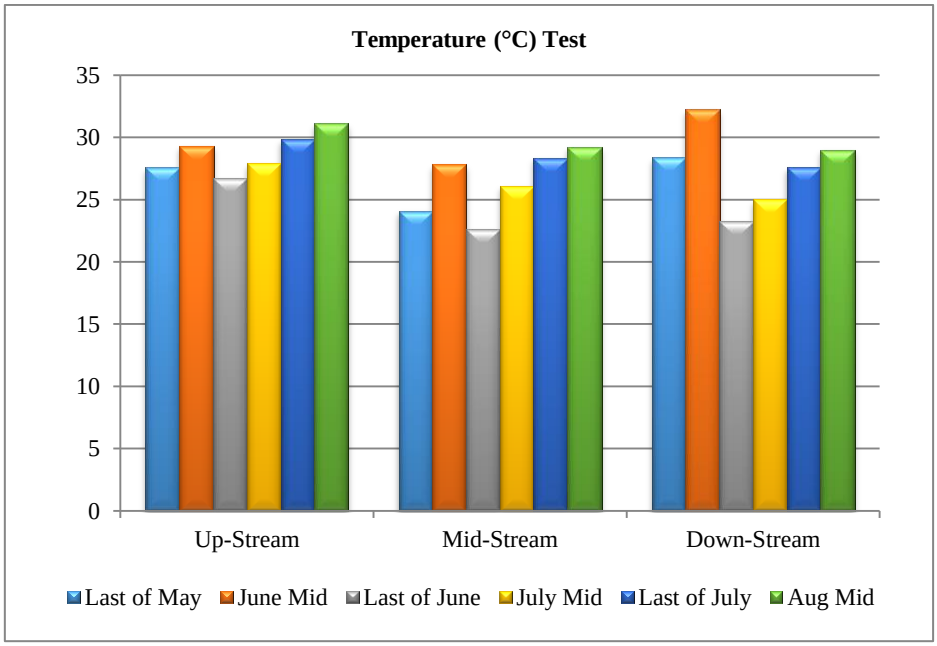

Fig 5.1: Test Data of Water Samples Analysis Done for Temperature (°C)

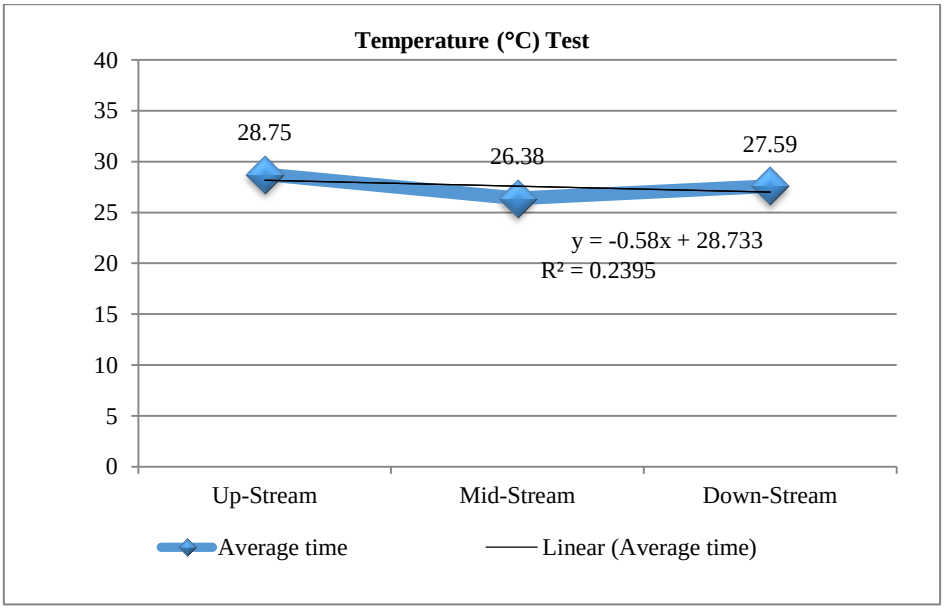

Fig 5.2: Average test data of Temperature (°C) from last May to mid-August

Table 5.2: Test Data of Water Samples Analysis Done for pH

pH Test				
S. No.	**Collection Time**	**Up-Stream**	**Mid-Stream**	**Down-Stream**
1	Last of May	8.36	8.15	8.03
2	June Mid	8.57	7.87	7.63
3	Last of June	7.83	8.46	7.72
4	July Mid	8.64	8.21	7.34
5	Last of July	8.78	7.83	8.36
6	Aug Mid	8.31	8.24	8.52
7.	Average time	8.42	8.13	7.93

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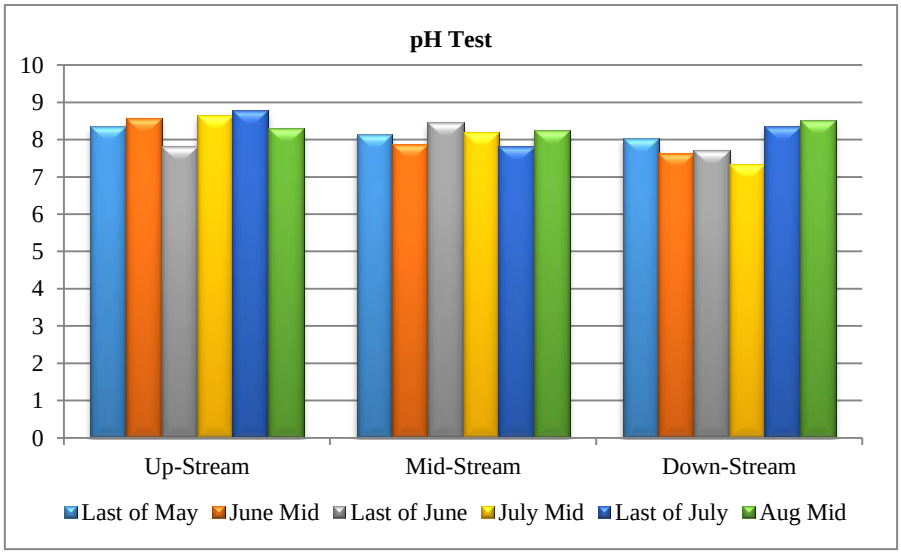

Fig 5.3: Test Data of Water Samples Analysis Done for pH

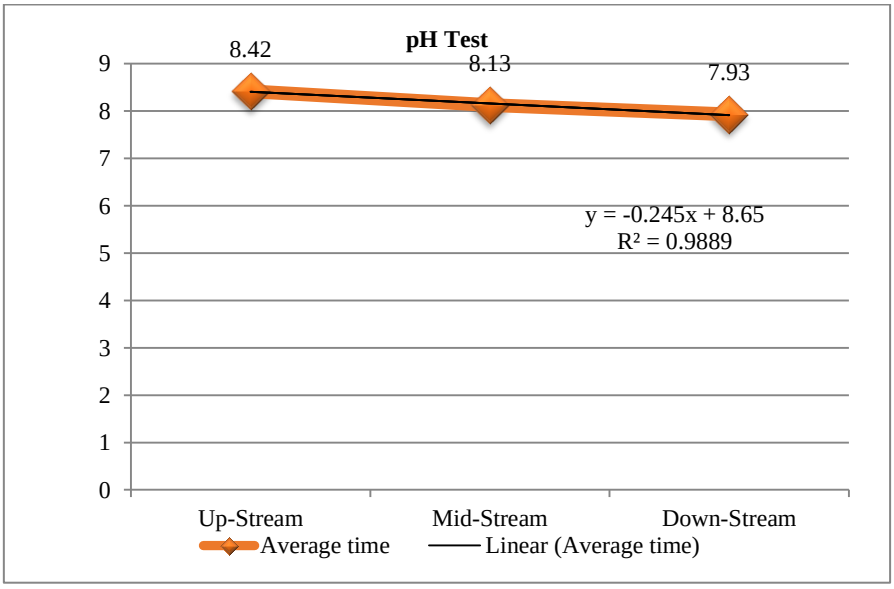

Fig 5.4: Average test data of pH from last May to mid-August

Table 5.3: Test Data of Water Samples Analysis Done for Turbidity (mg/l)

	Turbidity (NTU)Test			
S. No.	**Collection Time**	**Up-Stream**	**Mid-Stream**	**Down-Stream**
1	Last of May	9.51	9.30	10.78
2	June Mid	10.61	10.40	12.87
3	Last of June	14.41	15.18	16.68
4	July Mid	15.21	16.03	16.93
5	Last of July	12.61	13.46	12.81
6	Aug Mid	11.92	11.74	12.19
7.	Average time	12.38	12.69	13.71

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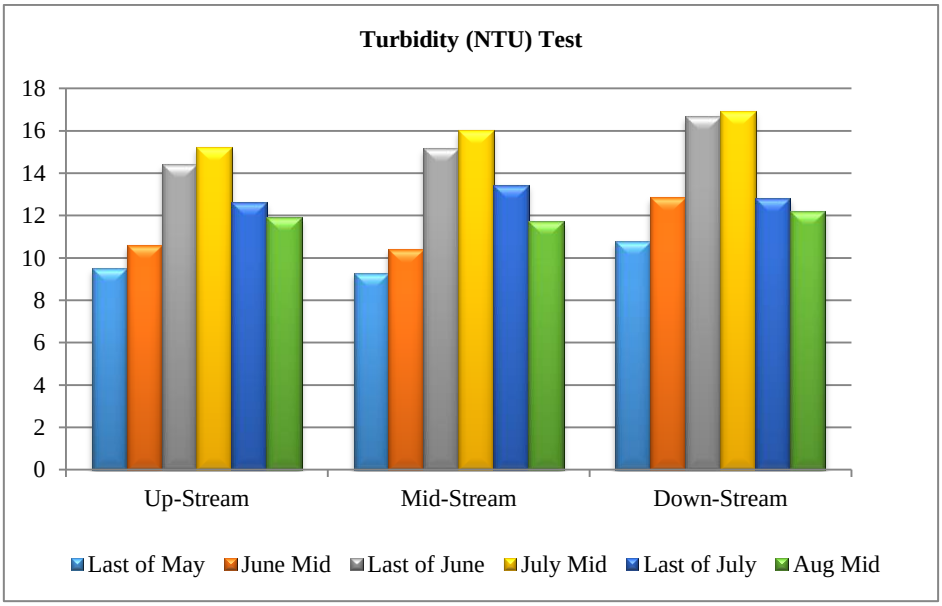

Fig 5.5: Test Data of Water Samples Analysis Done for Turbidity (mg/l)

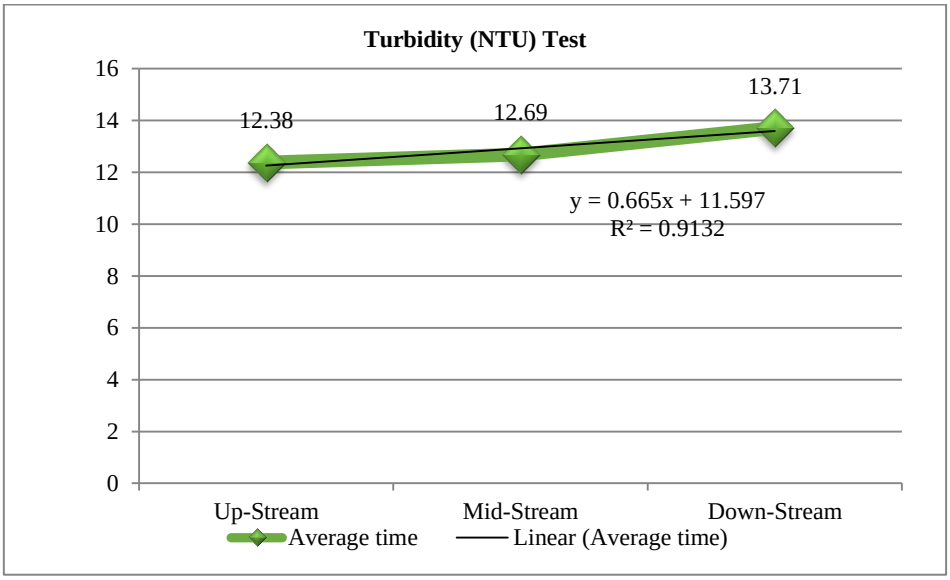

Fig 5.6: Average test data of Turbidity (mg/l) from last May to mid-August

Table 5.4: Test Data of Water Samples Analysis Done for Conductivity

Conductivity Test (dsm^{-1})				
S. No.	**Collection Time**	**Up-Stream**	**Mid-Stream**	**Down-Stream**
1	Last of May	0.35	0.43	0.39
2	June Mid	0.49	0.38	0.37
3	Last of June	0.32	0.52	0.51
4	July Mid	0.33	0.67	0.54
5	Last of July	0.43	0.59	0.57
6	Aug Mid	0.38	0.51	0.68
7.	Average time	0.38	0.52	0.51

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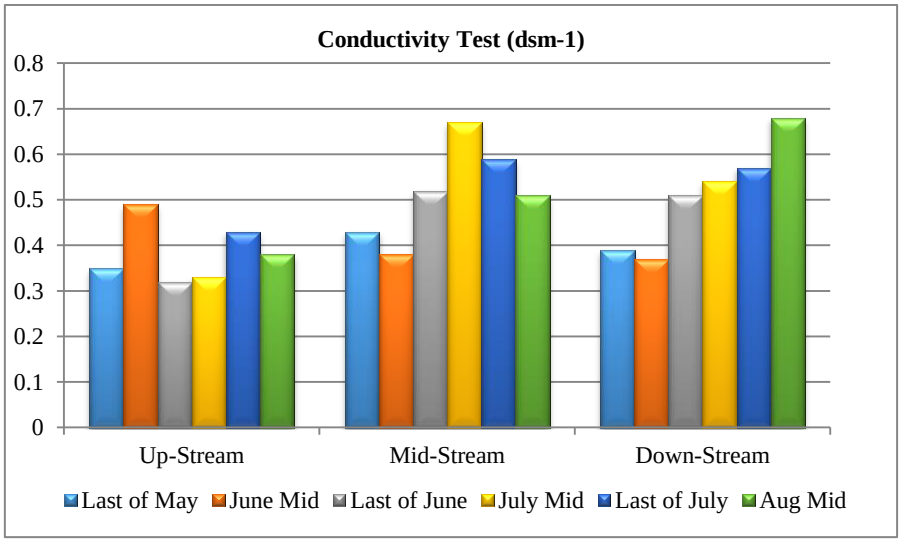

Fig 5.7: Test Data of Water Samples Analysis Done for Conductivity

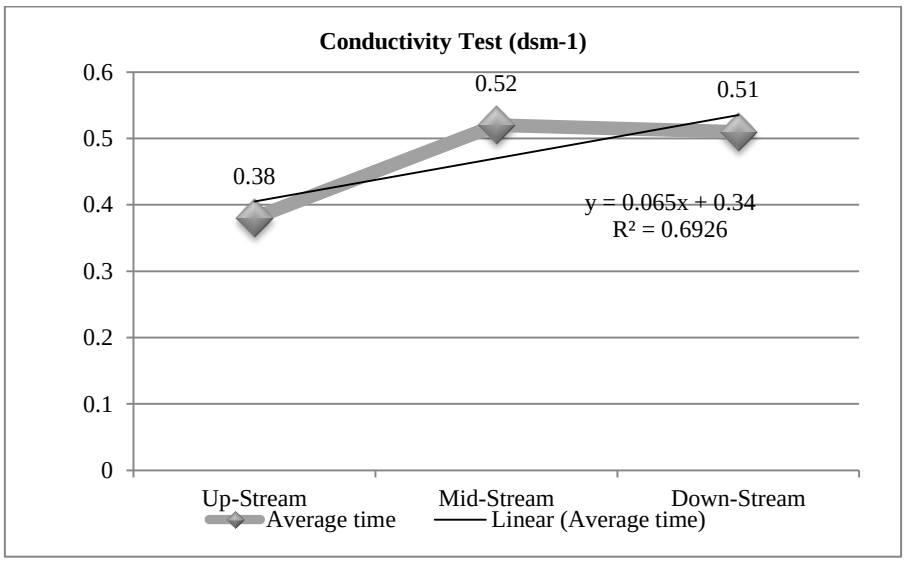

Fig 5.8: Average test data of Conductivity from last May to mid-August

Table 5.5: Test Data of Water Samples Analysis Done for Total Dissolved Solids (mg/l)

Total Dissolved Solids (mg/l)Test			
Collection Time	**Up-Stream**	**Mid-Stream**	**Down-Stream**
Last of May	148	257	169
June Mid	159	283	182
Last of June	137	164	153
July Mid	126	158	147
Last of July	130	140	144
Aug Mid	123	183	171
Average time	137	198	161

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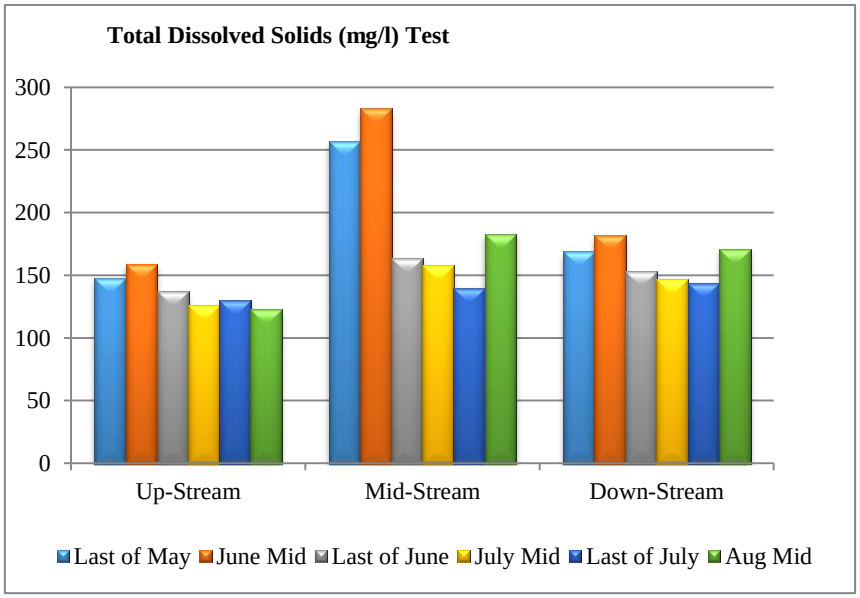

Fig 5.9: Test Data of Water Samples Analysis Done for Total Dissolved Solids (mg/l)

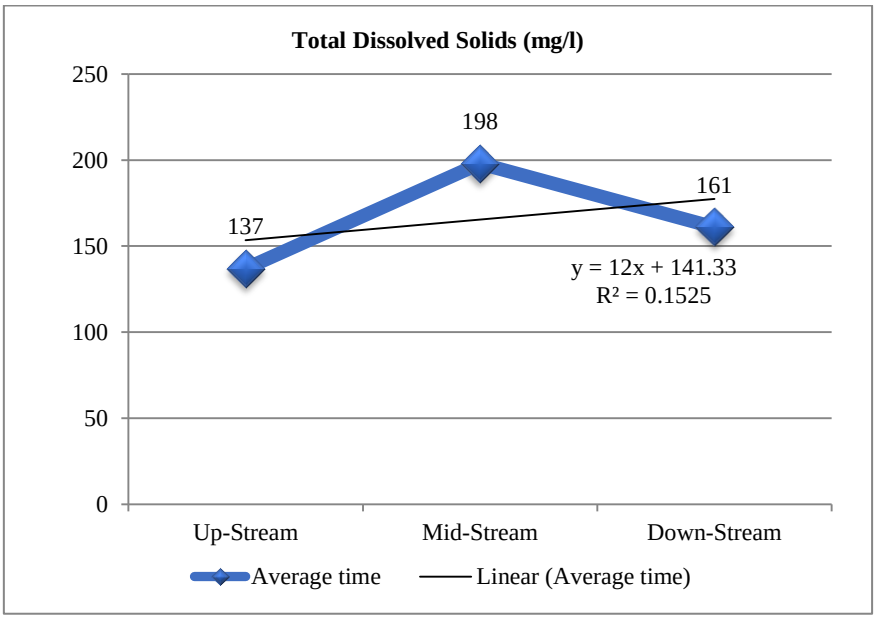

Fig 5.10: Average test data of Total Dissolved Solids (mg/l) from last May to mid-August

Table 5.6: Test Data of Water Samples Analysis Done for Hardness

Hardness Test (mg/l)				
S. No.	**Collection Time**	**Up-Stream**	**Mid-Stream**	**Down-Stream**
1	Last of May	237	263	185
2	June Mid	252	279	163
3	Last of June	328	214	258
4	July Mid	376	362	361
5	Last of July	385	342	338
6	Aug Mid	293	306	289
7.	Average time	312	294	266

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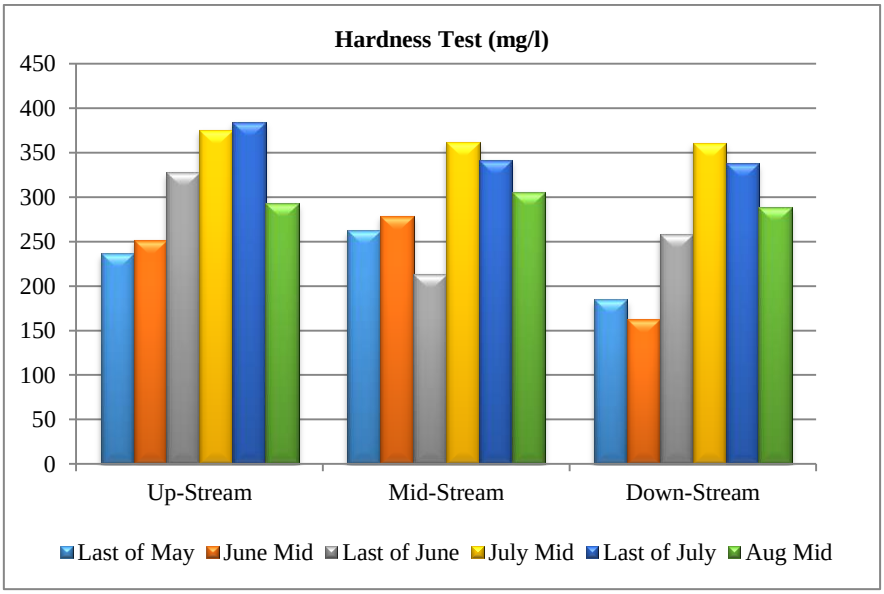

Fig 5.11: Test Data of Water Samples Analysis Done for Hardness

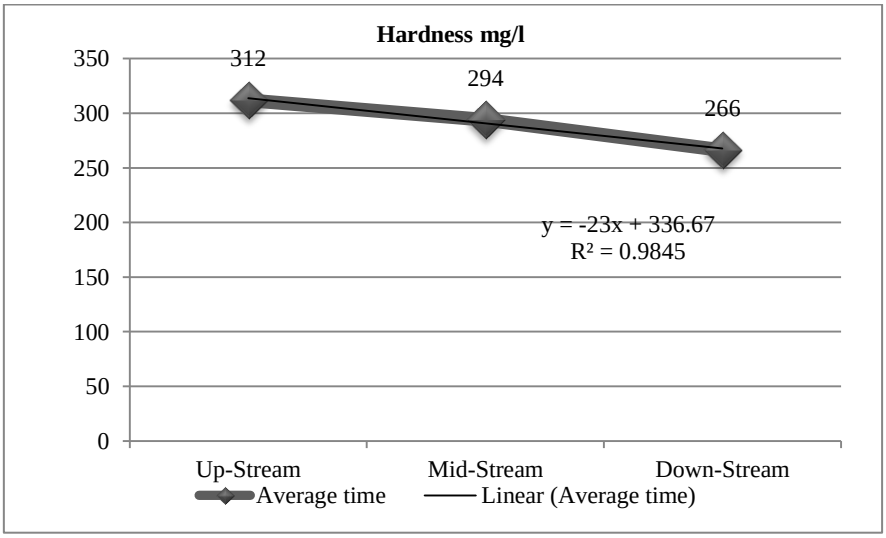

Fig 5.12: Average test data of Hardness from last May to mid-August

Table 5.7: Test Data of Water Samples Analysis Done for Dissolved Oxygen

Dissolved Oxygen Test (mg/l)				
S. No.	**Collection Time**	**Up-Stream**	**Mid-Stream**	**Down-Stream**
1	Last of May	3.78	6.21	5.89
2	June Mid	4.16	6.93	6.04
3	Last of June	6.82	7.11	6.39
4	July Mid	7.25	8.25	7.48
5	Last of July	5.11	7.64	8.23
6	Aug Mid	4.27	7.49	7.81
7.	Average time	5.23	7.27	6.97

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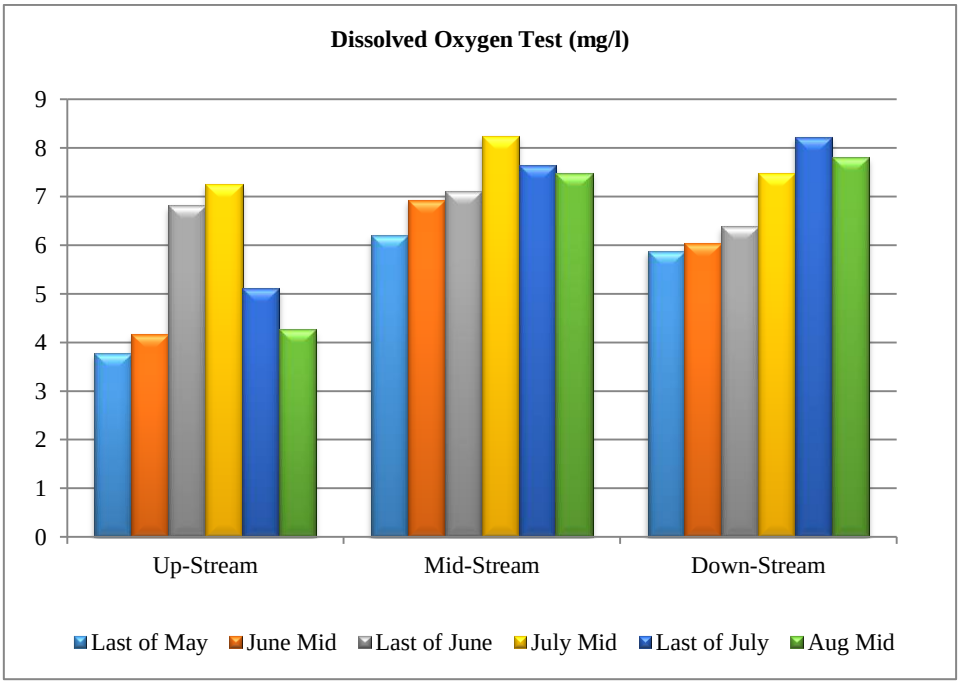

Fig 5.13: Test Data of Water Samples Analysis Done for Dissolved Oxygen

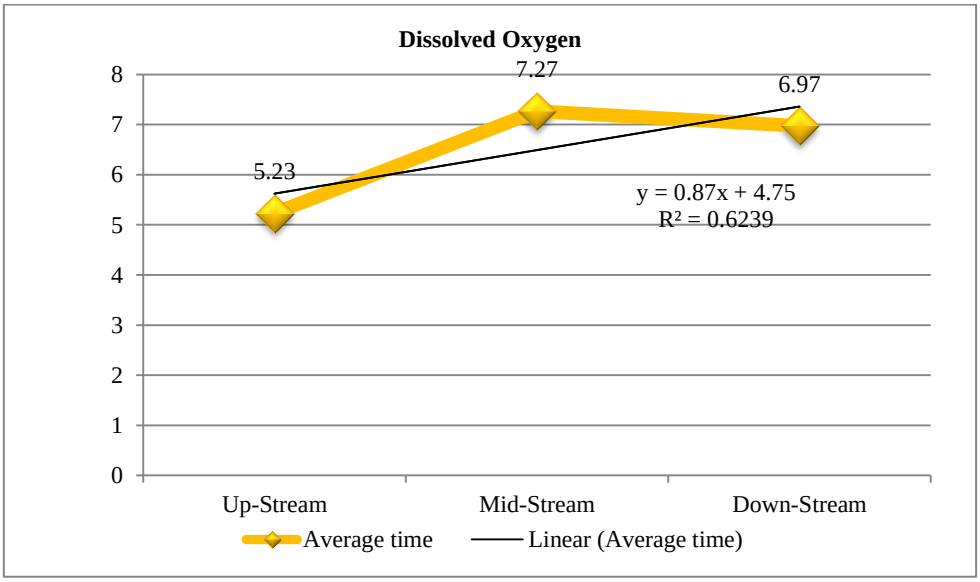

Fig 5.14: Average test data of Dissolved Oxygen from last May to mid-August

Table 5.8: Test Data of Water Samples Analysis Done for Biological oxygen Demand (BOD) mg/l

BOD Test				
S. No.	**Collection Time**	**Up-Stream**	**Mid-Stream**	**Down-Stream**
1	Last of May	4.89	2.61	4.72
2	June Mid	4.82	3.04	4.59
3	Last of June	4.53	3.26	3.11
4	July Mid	3.38	6.19	3.78
5	Last of July	1.74	5.38	4.05
6	Aug Mid	2.37	4.82	4.67
7.	Average time	3.62	4.22	4.15

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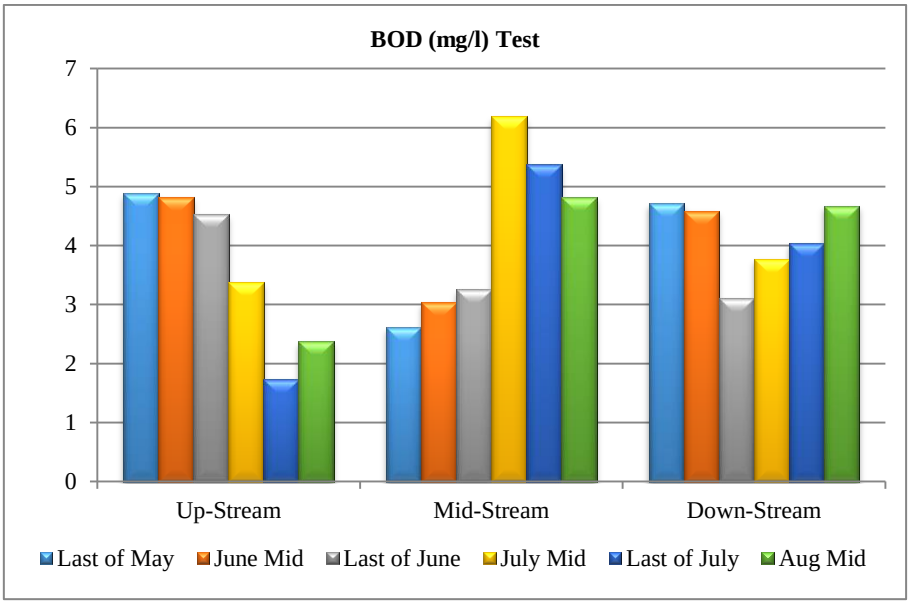

Fig 5.15: Test Data of Water Samples Analysis Done for Biological oxygen Demand (BOD) mg/l

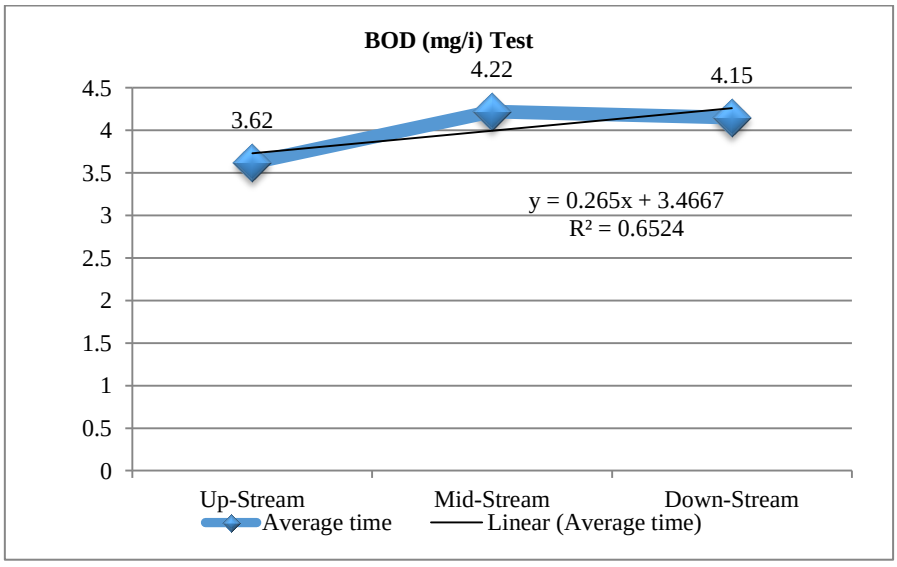

Fig 5.16: Average test data of BOD mg/i from last May to mid-August

Table 5.9: Test Data of Water Samples Analysis Done for Chloride

Chloride Test				
S. No.	**Collection Time**	**Up-Stream**	**Mid-Stream**	**Down-Stream**
1	Last of May	38.73	61.20	43.74
2	June Mid	47.21	88.35	49.03
3	Last of June	73.86	38.72	56.22
4	July Mid	67.24	59.31	136.05
5	Last of July	58.02	129.21	79.08
6	Aug Mid	50.43	173.48	94.37
7.	Average time	55.92	91.71	76.42

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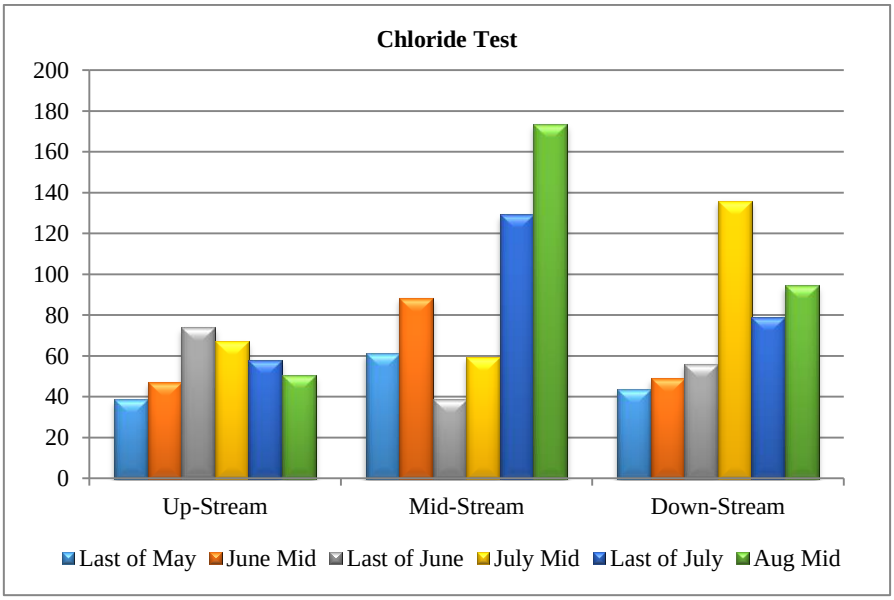

Fig 5.17: Test Data of Water Samples Analysis Done for Chloride

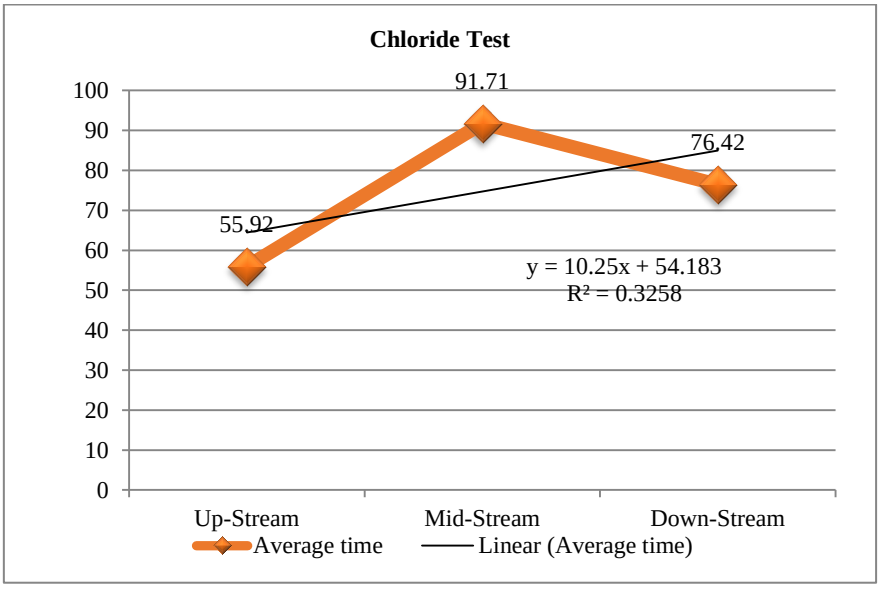

Fig 5.18: Average test data of Chloride from last May to mid-August

Table 5.10: Test Data of Water Samples Analysis Done for Alkalinity

Alkalinity Test				
S. No.	**Collection Time**	**Up-Stream**	**Mid-Stream**	**Down-Stream**
1	Last of May	75.11	91.56	70.31
2	June Mid	89.28	94.49	74.29
3	Last of June	114.74	137.21	122.10
4	July Mid	130.32	160.24	147.26
5	Last of July	97.36	113.11	87.02
6	Aug Mid	93.17	102.30	73.69
7.	Average time	100.00	116.49	95.78

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:12/December-2022 Impact Factor- 6.752 www.irjmets.com

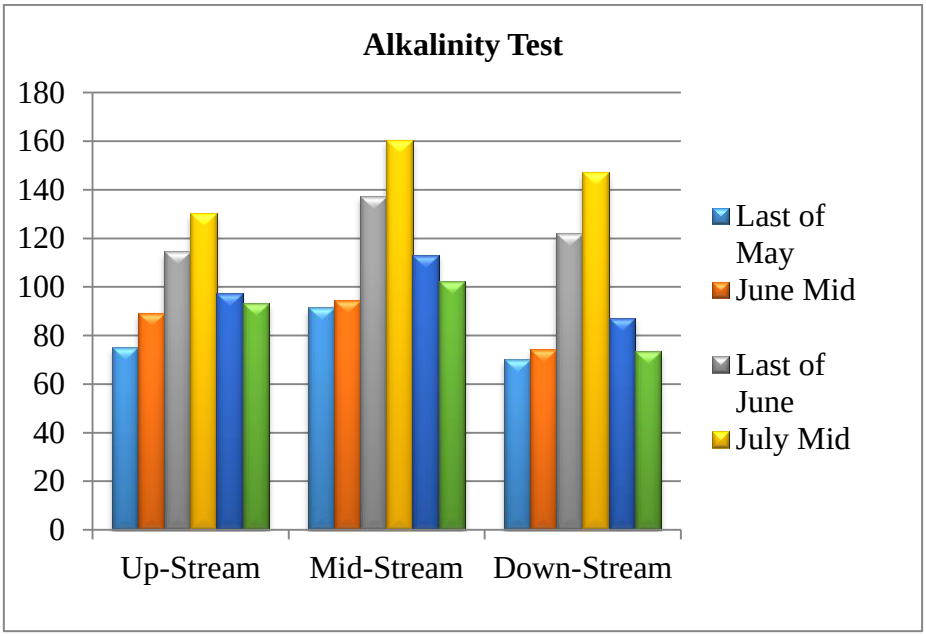

Fig 5.19: Test Data of Water Samples Analysis Done for Alkalinity

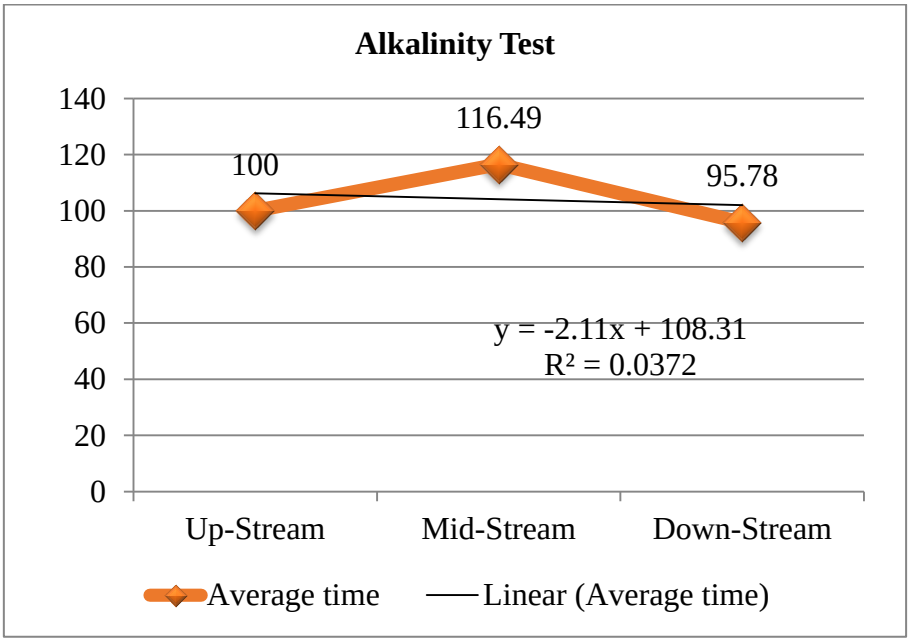

Fig 5.20: Average test data of Alkalinity from last May to mid-August

VI. CONCLUSION

Conclusions of Water Samples Testing Results

TEMPERATURE:

- Temperature of water in pre monsoon is site1 was found to be on an average _+ 27.58 in site2 the average value is _+4.12 and in site3 the average value is -+28.39.
- During monsoon the average value of site1 temperature is _+29.85 and in site2 the average value is _+28.36 and in site3 the average value is _+ 27.59.

pH

One of the most crucial elements affecting aquatic life in every body of water is pH. Both organic and inorganic solutes found in water can impact the pH In the present study, pH ranges from 7.83 to 8.57 in site1 and in site2 it ranges from 7.87 to 8.46 and for site3 its range is 7.6 to 8.03 and during monsoon the ph value at site1 range from 8.31 to 8.78 at site 2 7.83 to 8.24 and site 3, 7.34 to 8.52. pH readings have been seen to be greater during

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monsoon than pre-monsoon. The increased photosynthesis of the algal blooms that occur in the precipitation of calcium and magnesium carbonates during the monsoon season may be the cause of the highest pH values.

ELECTRICAL CONDUCTIVITY

It is a measurement of the water's ability to carry an electric current in bodies of water. It is an indicator of the total amount of soluble salts and mineral salts in the water, which makes it sour and unfit for drinking. in the present study EC varies from 0.32 to 0.49 in pre monsoon site 1, 0.38-0.52 in site2 and 0.37 to 0.51 in site3.During monsoon EC varies from 0.33 to 0.43 in site1, 0.51 to 0.69 in site2 and 0.54 to 0.68 in site3.

TOTAL DISSOLVED SOLIDS

The regulation of the biological and physical water treatment processes is greatly impacted by TDS. The river water's maximum turbidity and EC value are a result of the highest concentration of total dissolved solids. TDS site1 varied from 137-148 mg/l ,164-283 mg/l in site2 and 153-182mg/l in site3 in pre monsoon. During monsoon 123-126mg/l in site1,140-183mg/l in site 2 and 144-171mg/l in site3

HARDNESS

The amount of dissolved salts in the water determines hardness primarily. Concentrations of multivalent metallic ions of calcium and magnesium are what cause the water's hardness. In the present study, it is found that hardness ranges from 237-328 mg/l at site1, 214-279 mg/l at site 2 ,163-258 mg/l at site 3 in pre monsoon. During monsoon 293-385mg/l at site1 ,306-362mg/l at site 2 and 289-361 mg/l at site3. The trend of variation is non-uniform at all sites. The digestive tract is negatively impacted by hard water, and calcium oxalate deposits accumulate in the bladder.

CHLORIDE CONTENT

It is combined with calcium, sodium, or magnesium to form one of the main anions found in water. Highly mobile chloride ions are transferred to closed basins. Due of its great mobility, the chloride ion is carried to enclosed basins. Inorganic fertilizers, animal feeds, septic tanks, landfill leachate, and atmospheric precipitation are the principal sources of chloride in surface water and groundwater. In this study the chloride content in pre monsoon is 38.73-73.86 mg/l in site1,38.72-61.20mg/l in site 2and 43.74 to 56.22 mg/l in site3. During monsoon, 50.43tp 67.24 in site1,59.31 to 173.48 in site 2 and 79.08 to 136.05 in site3

DISSOLVED OXYGEN

Dissolved oxygen concentrations in surface water bodies show that they can sustain aquatic life. The high DO readings indicate that water is regenerating oxygen at a faster pace than it is being used. A sufficient DO is required for high water quality. DO levels between 5.0 and 8.0mg/l are satisfactory for survival and growth of aquatic organisms. DO contents range from 3.78-6.82mg/l in site1,6.21-7.11 mg/l in site2 ,5.89-6.39 in site 3 in pre monsoon .During monsoon 4.27 -7.25mg/l in site 1,7.49 to 8.25 in site2 ,7.48 to 8.23 in site3.

BIOCHEMICAL OXYGEN DEMAND

The BOD measures the quantity of oxygen that living things (microbes) need to use or stabilize organic substances. In other words, the BOD represents how much oxygen the microbes need to flourish in wastewater. It is a crucial indicator of a water body's organic pollution state. Industrial wastewater has a BOD value of 25000mg/l while unpolluted water has a BOD value of 3mg/l or less. The value of BOD was more in during monsoon but its value was also high in pre monsoon.

TURBIDITY

Turbidity precipitated by potential pf particles suspended or dissolved in water that scatter mild making the water appear cloudy on testing the turbidity in pre monsoon ranges from 9-14.41 in site1,9.30-15.18NTU in site2 and 10.78-16.68NTU in site3 and during monsoon 15.21 to 11.92 in site1,16.03 to 11.74 in site2 and 16.93 to 12.19 in site3.

ALKALINITY

A water sample's capacity to quantitatively lower a potent acid to a pH Increased River water dilution may be the reason for lower alkalinity readings during the wet season. The high value of alkalinity indicates the presence of weak and strong bases such carbonates, bicarbonates, and hydroxides in the water body. In the present investigation, alkalinity at site1 ranged from 75.11 to 114.74mg/l,91.56 to 137.21mg/l in site2 and

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70.31 to 122.10 mg/l in site3 in pre monsoon. During monsoon the values range from 130.32 to 93.17 in site1,160.24 to 102.30 in site2 and 147.26 to 73.69 in site 3.

It might be concluded that the water in the research location has greater total solids and is generally alkaline in nature, as well as being above saturated with dissolved oxygen. The parameters chlorides, hardness, and alkalinity are all well within the acceptable ranges, however some of them have slightly higher ranges set by CPCB that make them unsuitable for usage in residential and commercial settings. Sangam water is unsafe for drinking at some locations due to slightly higher DO and BOD readings. The Sangam's water quality was found to be primarily contaminated by mass bathing and the direct discharge of sewage water from the city, which was a significant contributing cause. Chloride, turbidity, and temperature, Total hardness, it displays the category of pollution that is caused by humans, including discharge that has not been fully or partially treated. High pH, DO, and BOD levels, however, indicate that filtration could be required for household consumption. Those who dump rubbish or discharge local effluents into the Sangam should face harsh legal consequences.

VII. FUTURE SCOPE OF THE WORK

- In future this study also performed in winter and summer season, result is comparing with monsoon season.
- Treatment methods also discus for improve the water quality.
- With the help of this research data used in future to prepare model for pollution control.

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