Orinigal Article

Seasonal Dynamics of Water Quality in the Turag River: A Multifaceted Analysis

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Abstract: Bangladesh is a riverine country, surface water is now used for different reasons in different countries than groundwater. However, despite the fact that Bangladesh has an abundance of surface water, are unable to use it. The land and environment are under immense pressure as a result of industry's fast expansion and increased pollution. Very few people are aware of this globally increased issue, and Bangladesh, in particular, is currently in a vulnerable position. Bangladesh, as a developing country that is presented with numerous major environmental issues, particularly in the area of water, as a result of rapid industrialization and urbanization, obstinate customs, poor economic situations, and a lack of understanding and technology in the country. This study determined different water quality parameters of the Turag River in different seasons. The locations of the study areas along the Turag River. Samples were taken in Turag close to the Abdullahpur Bridge, Bishwa Ijtema Field and Tongi Railway Bridge. The bottles were sealed and appropriately labelled for identification of the sample process. Collected water for testing from three points. Point three is Ijtema Ground, Abdullahpur Bridge, and Tongi Railway Bridge. Collected water from these points in six seasons, the water is infiltrated slow sand filter. Before and after infiltrating the water, do five tests for pH, TSS, TDS, turbidity, and COD. After doing the tests like Ph, TDS, TSS, COD and Turbidity. The water quality of Turag River varies from time to time. Maximum pollution is found in late autumn and winter. Depending on the results, it can be said that the water of Turag River is polluted. The study recommend that the fertilizers and chemicals should be stopped. Necessary initiatives should be taken to realize the importance of water among the citizens, the navigability of the river should be increased by dredging, various chemical and fertilizers are mixed in the arable land along the river, these fertilizer and chemicals get mixed in the river water with rain.

Keywords: environmental issues, industrialization, Bangladesh

1. INTRODUCTION

Due to its toxic and chemical character, industrial effluent is one of the most serious environmental challenges, necessitating on-site treatment and careful management before release into the sewer system [1]. The land and environment are under immense pressure as a result of industry's fast expansion and increased pollution. Very few people are aware of this globally increased issue, and Bangladesh, in particular, is currently in a vulnerable position [2]. Bangladesh, as a developing country, is presented with numerous major environmental issues, particularly in the area of water, as a result of rapid industrialization and urbanization, obstinate customs, poor economic situations, and a lack of understanding and technology in the country [3]. Water circumstances, such as regional and seasonal availability and quality, have a significant impact on Bangladesh's environmental and economic progress. In terms of quality, the country's surface water is vulnerable to untreated industrial effluents and municipal wastewater, as well as runoff pollution from chemical fertilizers and pesticides [4]. Water quality is also affected by effluent types and discharge quantities from various sectors, agrochemicals used in agriculture, seasonal water flow, and the river system's dilution capability [5]. Bangladesh's rapid industrialization over the last two decades has resulted in 30,000 large and small companies polluting the river system with their effluents. Pollution from industrial and municipal waste effluents, as well as agrochemicals, has reached catastrophic proportions in some bodies of water and rivers [6]. Dhaka is Bangladesh's capital city, located in the country's center. Five periphery rivers, including the Buriganga, Dhaleswari, Turag, Balu, Sitalakhya, and Tongi Khal, receive substantial amounts of municipal sewage and industrial effluent from Dhaka [7]. Along with the river, there are 300 outfalls of domestic and industrial effluents. The waterways are further polluted by the indiscriminate disposal of home, clinical, pathological, and commercial wastes, as well as the discharge of wasted fuel and human excreta [8]. Chemical, fertilizer, pesticides, textile, oil, power plant, ship repairing dock, cement, and tannery units are located in and around Dhaka [9]. Untreated industrial effluents, municipal wastewater, chemical fertiliser and pesticide discharge, and oil and lubricant leaks in and around river port operations threaten Dhaka river water quality. Since industrialization began in Bangladesh, pollution has skyrocketed. Konabari, Gazipur district, is Bangladesh's largest industrial belt with several domestic and foreign industries. Every day, Konabari businesses leak massive amounts of wastewater into the surrounding land, agricultural fields, irrigation channels, and surface water, finally entering the Turag River. More importantly, dirty water kills and reduces aquatic life reproduction. Recently the Department of Environment classified the four rivers Buriganga, Sitalakhaya, Turag, and Balu as Ecologically Critical Areas (ECA) to improve ecosystems. Ecologically Critical Areas (ECA) are ecosystems that have suffered from human activities. Four rivers in and around Dhaka show the effects of urbanisation and industrialization [10]. It eventually harms humans. Heavy metals kill water flora and animals, harm the ecology, and make life harder for nearby residents. Cu, Fe, Pb, Cd, Co, Mn, Zn, and other trace heavy metals cause significant harm to the aquatic environment and humans [11]. Industrial pollution is a growing environmental issue in Bangladesh. The country's limited industrial base accounts for 20% of GDP. Over half the contribution comes from manufacturing, which grew 5.04% between 1982 and 1992. Since the ready-made garments industry has risen significantly, so has the textile industry [12]. Coagulation, flocculation, quicksand, and progressive sand filtration purify water. Using slow sand filters. London uses SFFs, as did Western Europe until recently, and elsewhere. Slow sand filtering has declined in affluent countries due to rising land and labour costs, which elevate SSF-produced water costs. SSFs treat water cost-effectively when this is not the case (WHO n.y.). These conditions are common in developing nations, making it a promising method for water filtration and sustainable water systems. The process's principle is straightforward. Sand physically and biologically filters contaminated freshwater. This eliminates sediments and pathogens. This approach relies on organisms' infection-fighting abilities.

2. LITERATURE REVIEW

The number of chemical compounds used as raw materials in industry and infrastructure has expanded with the industry. Organic and inorganic material emissions into air, water, and soil rise. The problems are local, but their prevalence, scale, and potential implications are growing worldwide. Industrial wastes harm natural life through toxic activity or water quality changes [13]. A unsafe levels of industrial effluents and urban and agricultural waste in various Bangladeshi rivers and waterways. Dhaka, Bangladesh's capital, is one of the world's most populous cities with over 16 million, on the northern bank of the Buriganga River, the Turag, Dhaleshwari, Tongi Khal, Balu, and Sitalakhya rivers border it. Most businesses and manufacturing are around these rivers [14]. The Hazaribagh, Tejgaon, and Dhaka-Narayanganj-Demra dam sectors of Dhaka City have over 7000 industries along these rivers. Toxic waste from industrial areas and sewage lines, as well as petroleum from ships, launches, cargoes, boats, and so on, are polluting Dhaka City's rivers [15]. River water is black like burned motor fuel in the dry season. Most physicochemical parameters meet WHO water standards. Some factors have changed during the past 40 years. Dissolve oxygen was 2 mg/L in 2000 [16]. It could be due to changes in sample collection procedure, time, and location. However, most research showed that extreme river contamination occurs in the Buriganga river basin. River water is black like burned motor fuel in the dry season. The vast majority of physicochemical fields [17]. Heavy metals like Pb, Cd, and Cr make river water dangerous. On Dhaka's northern outskirts is the Turag River. Untreated industrial effluents, agricultural field wash, and slum sewage affect river water quality [18]. Most textile industries began here. Near the Turag River live farmers who employ inorganic fertilisers, pesticides, and herbicides. All waste lands in the river during the rainy season [19]. The Department of Environment labelled Turag River ecologically vulnerable. The upstream river water quality was poor due to the heavy industry in that area [20]. Farmers irrigate market crops using river water. People who eat vegetables, seafood, and rice from this area may have serious health issues. Research shows this area's crops contain hazardous elements. The Turag River's vegetation and animals bioaccumulated toxic metals, which could harm humans. A Sitalakhya River tributary joins the river near Demra after crossing extensive wetlands in Beels and Belai. It joins the Turag River in northern Dhaka via Tongi Khal. Tongi, Norai, and Rampura khals and canals connected to the Balu River. Khals and canals carried toxic industrial effluent to the Balu River [21]. Effluents from the Tongi industrial zone, textile, pharmaceutical, food, soap and detergent, metal, dying, and other industries pollute river water. Municipal and agricultural waste enter the Balu River.Because to growing pollution, the Department of Environment declared the Balu River an environmentally critical state river in 2009 [22]. Former Brahmaputra River in Bangladesh is the source of all major rivers. Sitalakhya River crosses eastern Dhaka to join the Meghna at Kolagachi, Munsiganj. It draws water from the Balu and Dhaleshwari rivers [23]. Several factories were established on the riverbank through the canal, especially in Narayanganj, where industry is dense. The Sitalakhya River provides most cooking, drinking, bathing, washing, irrigation, and industrial water. Textile, cement, fertiliser, pulp and paper, sugar mill, jute, and other riverbank enterprises affect Sitalakhya River water quality. Pretreatment involves "roughing" treatment methods like sedimentation, storage, and roughing filtration to remove bigger, settleable particles before water enters the main treatment units. Pretreatment during high turbidity times can reduce the load on subsequent treatment units and save operating costs, especially for chemicals [24]. Rapid mix devices at the plant's head end cause severe turbulence in raw water entry. Simple to build, run, and maintain with local resources and labour, hydraulic fast mixers including hydraulic jumps, flumes, and weirs can generate enough turbulence without mechanical equipment. The coagulant enters the raw water through an above-water perforated trough or pipe diffuser upstream of the peak turbulence [25]. Particle accumulation increases bed pressure loss for a given flow rate. In a gravity-fed bed, flow rate falls with constant pressure. Back-washing the bed removes particles when pressure loss or flow is unacceptable and the filter is no longer functioning. A fast pressurised sand bed filter occurs at 0.5 bar pressure drop. Pour backwash fluid through the bed to fluidize and expand by 30%. Sand grains combine and rub together, removing particle solids. Backwash fluid removes smaller particles to a settling tank. It takes a few minutes to fluidize the bed, but it requires 3 to 10 m3/m2/hr. Restocking the bed may be necessary after backwashing loses some sand [26].

3. MATERIALS AND METHODS

The locations of the study areas along the Turag River. Samples were taken in Turag close to the Abdullahpur Bridge, Bishwa Ijtema Field and Tongi Railway Bridge. The location of the Bishwa Ijtema in Tongi is near the Turag River. The initial location for sampling, which accepts a variety of industrial and residential effluents, was Turag's Tongi Railway Bridge. One factor contributing to the Bishwa Ijtema's pollution is the presence of pilgrims who camp by the riverside for three to seven days without access to a decent sanitary system. Heavy contamination ensued from the discharge of trash in the river. The Abdullahpur point located at the place of abnormally high level of pollution and encroachment. Ijtema Field, Abdullahpur Bridge, and Turag River Tongi Railway Bridge were the three main locations from which three water samples were taken. 500 ml plastic bottles were utilised to gather samples. Before being collected, a detergent solution was used to clean the bottles. Grab sampling was used to collect each sample. The bottles were sealed and appropriately labelled for identification following the sample process. Collected water for testing from three points. Point three is Ijtema Ground, Abdullahpur Bridge, and Tongi Railway Bridge. Collected water from these points in six seasons. The water is infiltrated slow sand filter. Before and after infiltrating the water, do five tests for pH, TSS, TDS, turbidity, and COD. After doing the tests like Ph, TDS, TSS, COD and Turbidity.Can see that the performance of filter number 3 was good between other two filter. Number 3 filter making process used Sylhet sand, nuripathor, gravel and coal. Observe some differences between the tested values before and after infiltration by the filter. For the sieve analysis, 1020 grammes of dry Sylhet sand were used, and it was weighed using a digital scale. Then, using the US standard sieve, arrange it in ascending order. Shake well for several minutes while keeping the sample in the upper sieve. After that, measurements were made using the preserved sample. A pH meter is used to measure the acidity or alkalinity of hydrogen ion activity in a solution. Similarly, TDS meter is a small hand-held device used to indicate the total dissolved solids in a solution, usually water. Generally, a TDS level of between 50 and 150 is considered the most suitable and acceptable. If the TDS level is about 1000 PPM, it is unsafe and unfit for human consumption. Bring the samples to the laboratory for TDS testing. Then prepare the samples in different beakers for testing. Total sample size is eight. Bring reagent for COD. Use COD medium range of the Sample is 0-1500 mg/L to determine high-range reagent vials. Pick a fresh reagent vial for sample preparation level the vial with sample number/ID. To test the turbidity, took 10 mL of the water sample and measured the turbidity using the 10 mL of water turbidity machine.

4. RESULT & DISCUSSION

The result obtained on some physicochemical parameters of the Turag River water samples is presented in table below.

Table 01: Parameters of Turag River Raw and Filter water samples in the summer, Rainy, autumn, Late Autumn, winter, and spring seasons.

Name of Parameters	Season	Station			Mean ± SD	Bangladesh Standard	WHO
		Ijtema Ground (South West	Abdullahpur Bridge	Tongi Railway Bridge			

		Corner)									
		Raw	Filter	Raw	Filter	Raw	Filter	Raw	Filtrated		
pH	Summer	7.8	7.6	8	7.9	8.1	7.8	7.9 ± 0.15	7.7 ± 0.15	6.5-8.5	6.5-8.5
	Rainy	7.9	7.8	8	7.6	8	7.8	7.9 ± 0.05	7.7 ± 0.12		
	Autumn	8	7.7	8.1	8	7.9	7.7	8 ± 0.1	7.8 ± 0.17		
	Late Autumn	7.9	7.7	8.3	7.8	8	7.8	8.06 ± 0.20	7.7 ± 0.08		
	Winter	9.1	8.5	8.4	8	8.3	7.9	8.6 ± 0.43	8.1 ± 0.32		
	Spring	7.8	7.8	8	7.8	8	7.9	7.9 ± 0.11	7.8 ± 0.05		
TDS (mg/L)	Summer	330	311.66	350	337.6	300	284	326.66 ± 25.1	311.1 ± 26.8	1000	-
	Rainy	270	259.83	310	299	280	273.3	286.66 ± 20.8	277.38 ± 19.8		
	Autumn	590	577.66	560	540.6	470	461.1	540 ± 62.45	526.28 ± 59.56		
	Late Autumn	580	569.67	595	583.66	500	486	558.3 ± 51.07	546.4 ± 52.81		
	Winter	600	584	630	607.67	600	585	610 ± 17.32	592.2 ± 13.38		
	Spring	575	568.66	600	585.66	490	478.6	555 ± 57.66	544.33 ± 57.49		
TSS	Summer	43.78	40.90	44.7	41.93	46.2	41.59	44.9 ± 1.23	41.49 ± 0.49	75	
	Rainy	41.45	39.53	41.25	38.44	43.5	41.43	42.06 ± 1.24	39.80 ± 1.51		

(mg/L)	Autumn	45.66	43.19	52.47	49.65	51.3	46.94	49.81 ± 3.6	46.59 ± 3.2		
	Late Autumn	52.72	49.33	51.29	48.08	54.2	50.83	52.73 ± 1.45	49.49 ± 1.37		-
	Winter	56.29	52.55	54.66	51.62	55.8	52.28	55.58 ± 0.83	52.15 ± 0.47		
	Spring	53.30	49.59	48.5	44.51	49.6	47.82	50.46 ± 2.51	47.31 ± 2.57		

Name of Parameters	**Season**	**Station**						**Mean ± SD**		**Bangladesh Standard**	**WHO**
		Ijtema Ground (South West Corner)		Abdullahpur Bridge		Tongi Railway Bridge					
		Raw	Filter	Raw	Filter	Raw	Filter	Raw	Filtrated		
COD (mg/L)	Summer	50	47	46	44	53	50	49.66 ± 3.5	47± 3	4.00	5-20
	Rainy	38	34.33	39	36.33	45	43	40.66 ± 3.7	37.88± 4.5		
	Autumn	42	38.66	47	44.33	55	52.33	48 ± 6.55	45.11± 6.8		
	Late Autumn	52	49.34	56	53	60	54.66	56 ± 4	52.33± 2.7		
	Winter	58	54.66	61	57.66	66	61	61.66 ±	57.77± 3.1		

								4.04			
	Spring	51	48.33	50	47.33	57	53.3	52.66 ± 3.78	49.66±3.2		
Turbidity (NTU)	Summer	38.3	35.37	42.22	38.79	45.6	42.28	42.04 ± 3.65	38.81±3.4	10	-
	Rainy	35.58	31.78	36.4	32.84	38.33	34.29	36.77 ± 1.41	32.97±1.2		
	Autumn	55	50.66	50	45.33	47.5	43.80	50.83 ± 3.81	46.60±3.6		
	Late Autumn	61	56.33	57	52.33	55	50.67	57.66 ± 3.05	53.11±2.9		
	Winter	70	63.33	65	59.3	65	59.66	66.66 ± 2.88	60.77±2.2		
	Spring	65	58.66	61	54.66	62.66	56.67	62.66 ± 2.08	56.66±2		

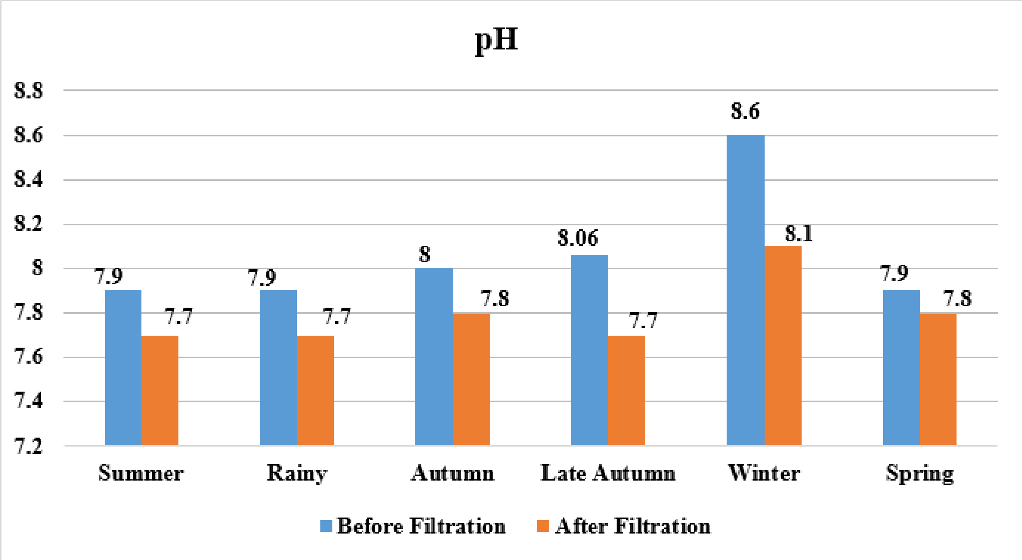

Figure 01: Before Filtration and After Filtration Value of pH

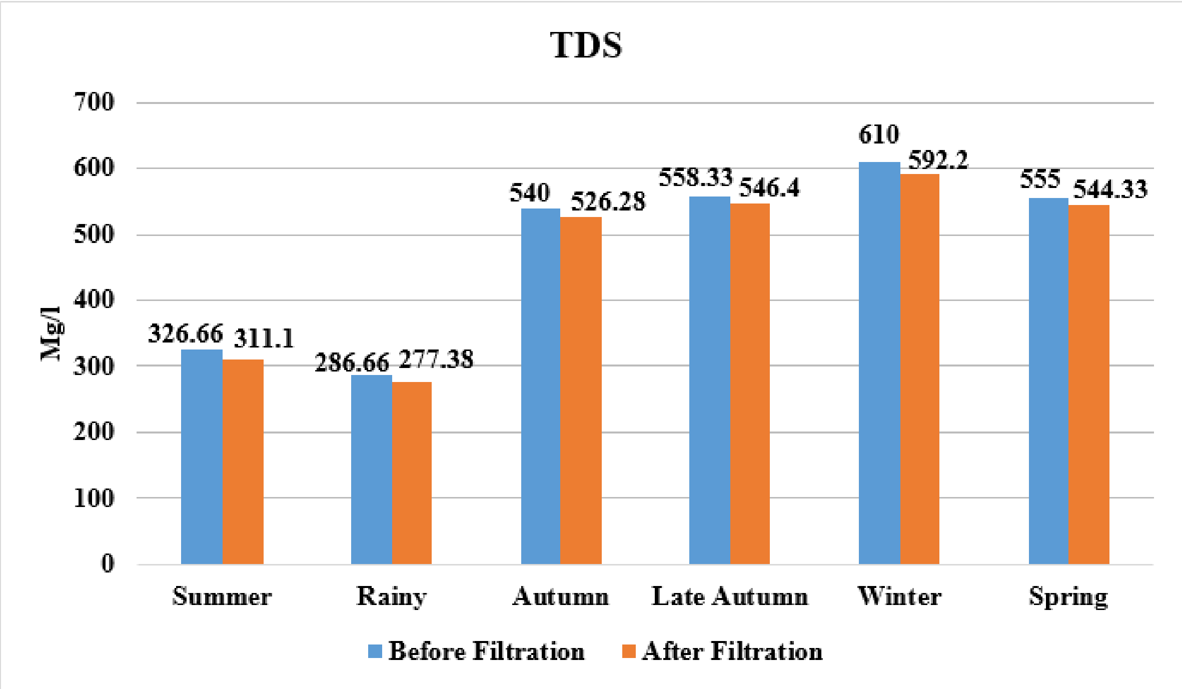

Figure 02: Before Filtration and After Filtration Value of TDS

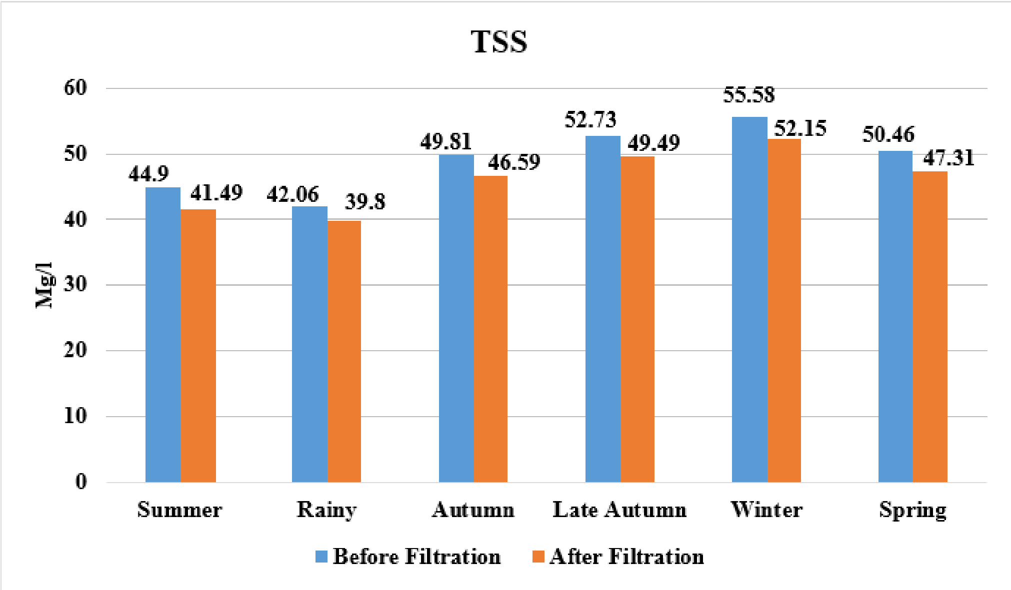

Figure 03: Before Filtration and After Filtration Value of TSS

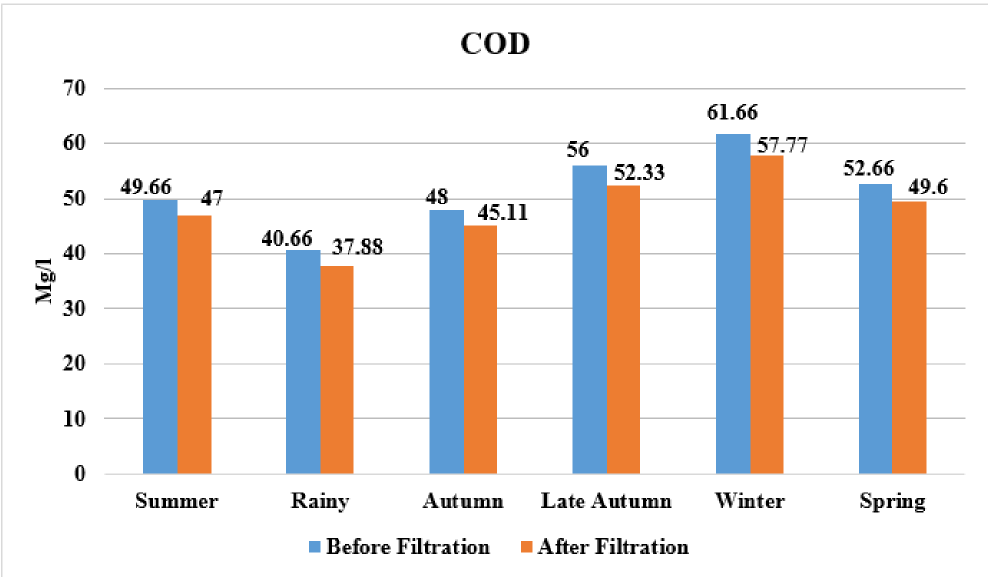

Figure 04: Before Filtration and After Filtration Value of COD

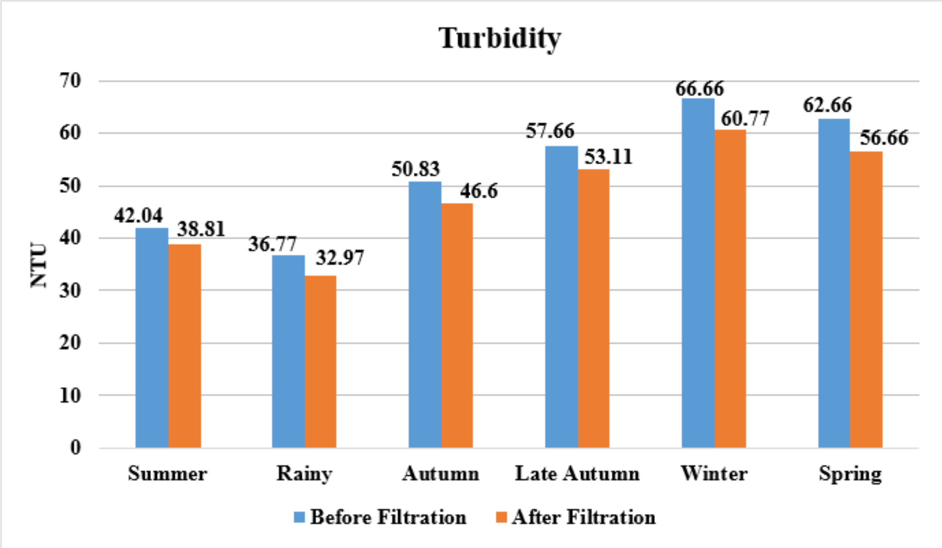

Figure 05: Before Filtration and After Filtration Value of Turbidity

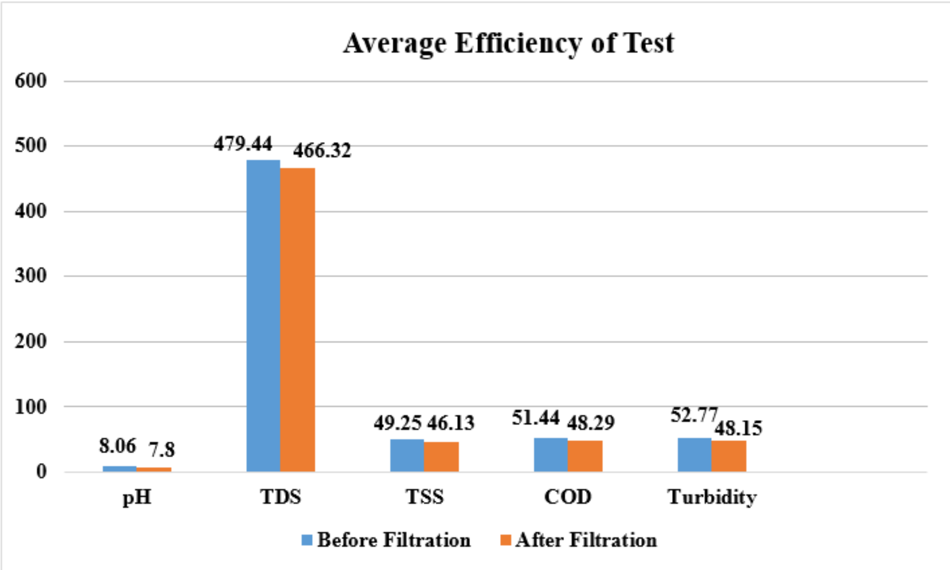

Figure 06: Average Efficiency of Before Filtration and After Filtration Value

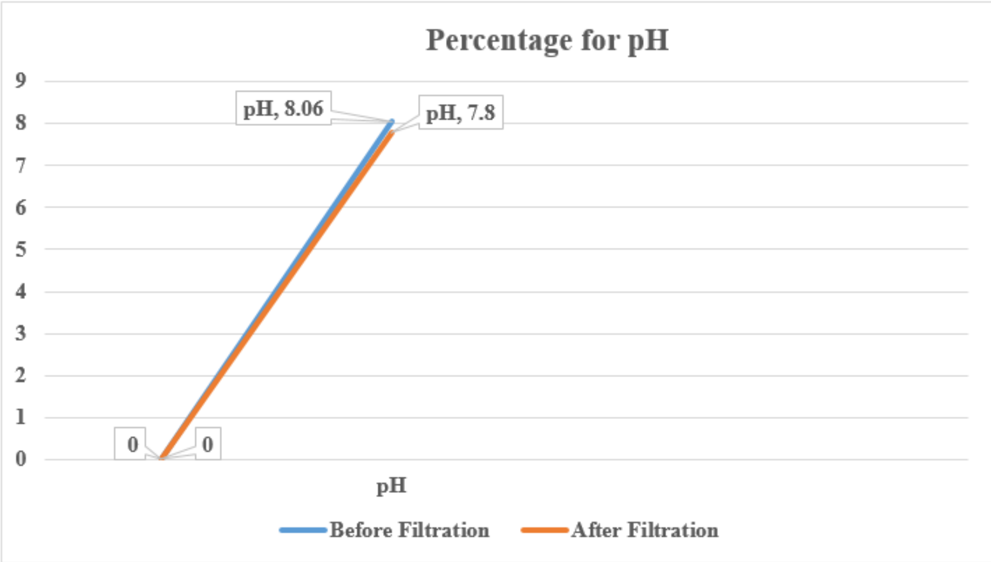

Figure 07: Percentage of Before Filtration and After Filtration pH Value

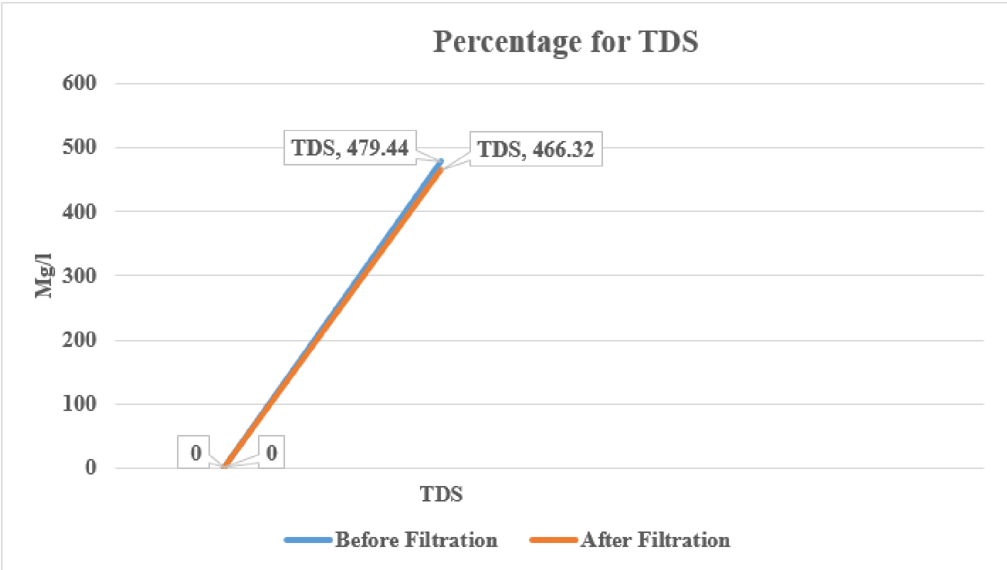

Figure 08: Percentage of Before Filtration and After Filtration TDS Value

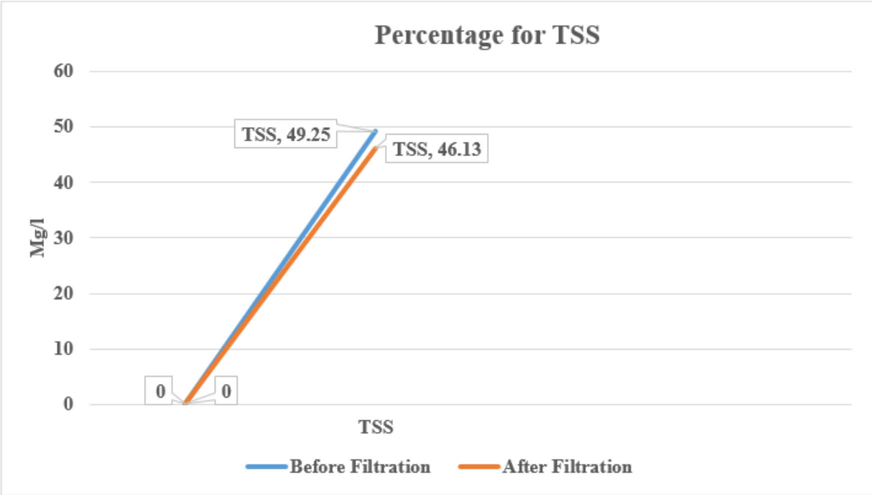

Figure 09: Percentage of Before Filtration and After Filtration TSS Value

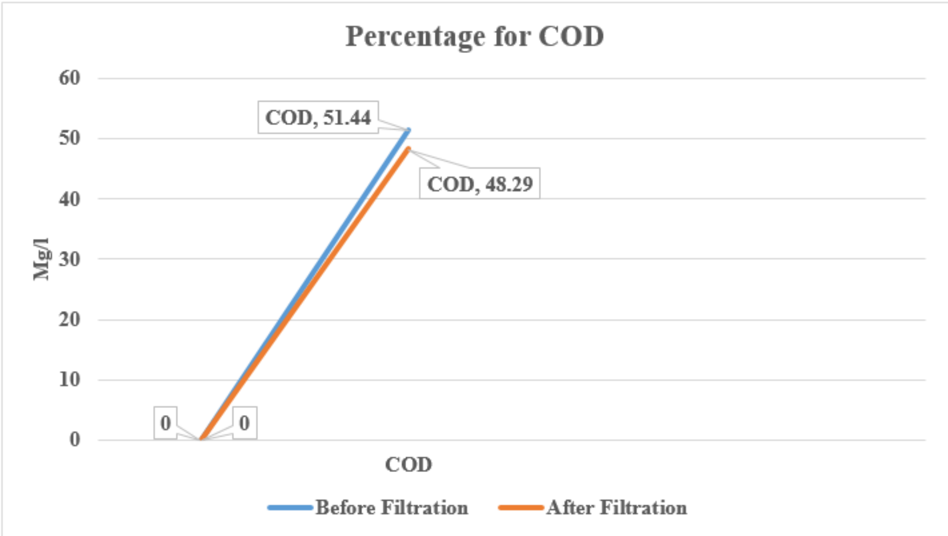

Figure 10: Percentage of Before Filtration and After Filtration COD Value

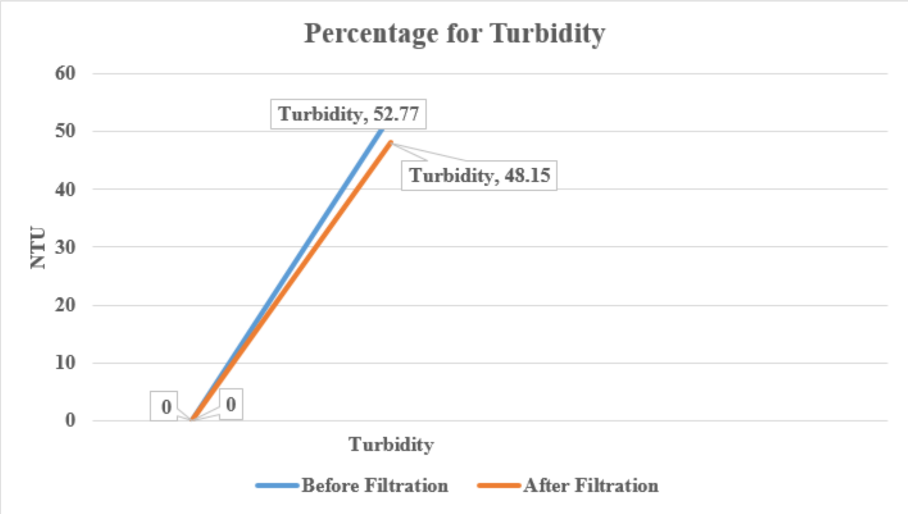

Figure 11: Percentage of Before Filtration and After Filtration Turbidity Value

Tests showed good water quality: 3.22% pH, 2.73% TDS, 6.33% TSS, 6.1% COD, and 8.8% Turbidity. Bangladeshi and WHO requirements for drinkable water pH are 6.5-8.5. In between: 8.5. In winter, Ijtema field has a pH of 9.1, far higher than drinkable. In five of six seasons, water pH is acceptable for agriculture, but winter pH is too high. Water with TDS per litre less than 300 is good, according to WHO recommendations. 300–600 mg/L is preferable. The ideal range is 600–900 mg/L. 900 to 1200 mg/L is harmful; higher is inappropriate. Bangladeshi TDS is 1000 mg/L. Agriculture tolerates 200–500 mg/l TDS. In summer, rainy season, and spring, TDS is 200–500. Water TDS is over 200–500 in the remaining 3 seasons. So agriculture may use summer, rainy, and spring water. Autumn, late autumn, and winter are all unsuitable for farming. Season 3 has a TDS value over 200-500. TSS testing of the water from the three places shows that Summer Rainy and Spring water can be used for agriculture at 50 mg per litre. Northern water is inappropriate for agriculture since its TSS value is over 50 in late autumn and winter. Tests show that summer, monsoon, and spring Turag River water is good. Monsoons and strong rains occur throughout summer. Spring river levels are high due to monsoon rains and fall to the bed. Due to river water rising, the water is clearer than in other seasons. Bangladesh specifies 10 NTU turbidity and WHO 5 NTU. Out of six seasons, it did not meet Bangladesh or WHO standards. The seasonal mean pH values for Summer, Rainy, Autumn, Late Autumn, Winter, and Spring were 7.9, 7.9, 8, 8.06, 8.6, and 7.9. Table shows the DoE standard pH 6–9 value for irrigation, home, and recreational purposes. The pH Ijtema Ground (South West Corner) Winter is over 9, making it unfit for irrigation or residential usage. Normal pH for surface water systems is 6.5–8.5 and groundwater is 6–8.5 (Gob, Environment Conservation Rules, 1997). Biological activity is highly affected by pH. It impacts water body features like organism activity and poisonous substance efficacy. Corrosiveness of water requires alkalinity and pH measurements. Except for the Railway Bridge station, all testing samples met the FAO drinking water criterion (1000 µs/cm). Total dissolved solids (TDS) indicate the presence of colloidal and dissolved minerals such ammonia, nitrite, nitrate, phosphate, alkalis, certain acids, sulphates, metallic ions, etc. Also a key water chemistry characteristic. Summer, Rainy, Autumn, Late Autumn, Winter, and Spring mean. According to WHO principles per litre of drinking water, the TDS value of the sample water was good because it varied little with TDS. Surface water COD is usually 20 milligrammes per litre or less for clean water. River and running water had COD levels over 200 mg/L. COD can range from 100 to 60,000 mg/L in industrial water. WHO limits COD in water to 10 ppm. Railway Bridge has greater COD since most industries are near its bank. Their organic/inorganic garbage enters this waterway. Concentrations were higher in the dry season and lower in the wet. Autumn had the highest value. The Railway Bridge had the highest COD in autumn and the lowest in spring. Water should not exceed 4 mg/L (DoE/BEMP, 2003). The three points' water samples had a mean turbidity of 52.77 NTU. The present investigation found higher Turag River water turbidity than the highest mean of 66.66 NTU. The seasonal mean turbidity values for Summer, Rainy, Autumn, Late Autumn, Winter, and Spring were 42.04, 36.77, 50.83, 57.66, 66.66, and 62.66 NTU. All levels surpass DoE (1997), DPHE (2019), and USEPA (2012) drinking and irrigation limits. Only the two contrasts—winter against rainy season and winter compared pre-winter—showed a substantial difference in turbidity. The three water samples had a mean TSS content of 49 mg/L. At 55 mg/L, Turag River water had more TSS. Industrial effluent entered the river through pipelines, canals, open drains, etc., polluting it and perhaps raising TSS levels. The seasonal mean TSS values for Summer, Rainy, Autumn, Late Autumn, Winter, and Spring were 44.49, 42.06, 49.81, 52.73, 55.58, and 50.46 mg/L. The assessed TSS values exceeded the drinking threshold, according to DPHE (2019). TSS values vary greatly by season, except for winter extremely summer and pre-winter versus wet season.

4.1 Discussion

Samples were taken from eight different points along the river to monitor the water quality: Mirpur Bridge (M B), Hazaribag (H B), Kamrangir Char (KC), Chandni Ghat (C G), Sadar Ghat (S G), Dholaikhal (DL), Bangladesh China Friendship Bridge (BCFB), and Pagla (Pa). pH ranged from 6.58 to 7.98 in 2015, while the normal pH range for inland surface water for fishing is 6.5 to 8.5. The pH ranged from 6.66 to 7.79 in 2014. In 2015, the dissolved oxygen (DO) level of the Buriganga river water was exceedingly low (0.0 mg/l). The DO of the Buriganga river was more than EQS (>5 mg/l) in 2015. The highest DO (5.70 mg/l) was measured at Mirpur Bridge in July, and the lowest (0.0 mg/l) was reported at all locations between January and April. The proximate reasons of DO depletion in the dry season are reduced water flow, direct discharge of untreated effluent from industries, residential wastes, and tannery wastes into the river, and during the wet season (June to October), the DO level in all river locations increased modestly. The Shitalakhya River is a tributary of the Brahmaputra. It is navigable throughout the year. Water samples were obtained from three separate places for monitoring water quality: Demra Ghat, Ghorasal Fertilizer Factory (GFF), and near the ACI factory in Narayanganj. Shitalakhya river water's pH in 2015 was within the EQS (6.5-8.5) range for inland surface water. At Ghorasal Fertilizer Factory (G.F.F), the greatest pH was 7.97 in March and the lowest PH was 6.66 in May. pH ranged from 6.8 to 7.8 in 2014. In 2015, the highest DO (5.5 mg/l) was discovered at G.F.F in August, while the lowest (0.0 mg/l) was discovered near the ACI facility in November and December. DO levels ranged from 0.0 to 5.6 mg/l in 2014. During a dry time in 2015, BOD levels at Damra Ghat were extremely high. BOD levels near the Ghorasal Fertilizer Factory were within the EQS (6 mg/l) for fisheries in May and June. As the industry has grown, so has the number of chemical compounds utilized as raw materials in the industry and industrial facilities. As a result, there is an increase in organic and inorganic material emissions into the air, water, and soil [27]. Although the problems occur in specific locales and regions, they are global in the sense that their incidence, scale, and possible consequences are quickly increasing [28]. Industrial wastes are recognized to have a negative impact on natural life, either directly through toxic action or indirectly through qualitative changes in the water's nature [29]. Pollution from industrial effluents and urban and agricultural garbage has reached dangerous levels in several rivers and water bodies in Bangladesh [30]. Dhaka City, Bangladesh's capital, is one of the world's most populous cities, with a population of more than 16 million people. It is situated on the northern bank of the Buriganga River, bordered by the Turag, Dhaleshwari, Tongi Khal, Balu, and Sitalakhya rivers. The majority of enterprises and factories are located on or near the banks of these rivers [31]. Because the amount of organic matter in the raw water limits the microorganisms, the stationary phase of bacterial populations occurs when the flow is stopped (where cell growth and cell death are at equilibrium). Organic matter is liberated and made accessible to microorganisms deeper inside the filter during this phase. This method achieves steady-state biological growth and organic matter biodegradation [32]. When the filter flow is interrupted, the pore and ponded water may become depleted of substrates, dissolved oxygen, and nutrients, endangering the filter's microorganisms. It has discovered a significant drop in DO within 2 hours of ceasing flow in a bacteriologically active filter. The generation of near-anaerobic conditions decreased the total fixed bacteria density in the filter. However, at lower water temperatures, when bacteria are already less active, the effect was less noticeable. Despite the reported loss in biomass, it has found minimal influence on the quality of generated water.

5. CONCLUSION

The study collected water samples from three points of Abdullahpur Bridge, Tongi Railway Bridge and South West Corner of Bishwa Ijtema Maidan in six seasons. The raw water parameters observed were not acceptable for drinking water purposes and also not acceptable for irrigation purposes because all parameters do not follow the irrigation range. For this research, make three filter, which is slow sand filter. After filtering number 3 filter performance is good between other two filter. The performance of these three filters is good in that it removes some impurities. The water quality of Turag River varies from time to time. Maximum pollution is found in late autumn and winter. After filtration, it is observed that Turag river water is not suitable for drinking water purpose but mostly suitable for irrigation purpose as per water quality range of Bangladesh. Depending on the results, it can be said that the water of Turag River is polluted.

6. RECOMMENDATION

Some recommendation for de-pollution of Turag River are following.

- Necessary initiatives should be taken to realize the importance of water among the citizens, the navigability of the river should be increased by dredging, various chemical and fertilizers are mixed in the arable land along the river, these fertilizer and chemicals get mixed in the river water with rain.
- The use of fertilizers and chemicals should be stopped. The construction of factories on the banks of the river should be stopped, as well as the treatment of chemical and tannery wastes from factories in major industrial areas of the country should be made mandatory and their safe disposal should be ensured.
- So it is mandatory to set up a treatment plant or Effluent Treatment Plant (ETP) with every industrial plant. Mixing of oily effluents from factories should be prevented.
- Necessary measures should be taken to prevent encroachment, filling and pollution of rivers, proper enforcement of environmental laws and legal punishment of water polluters should be ensured.
- Public awareness is also needed in this regard.

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