ASSESSMENT OF STREAM WATER QUALITY IN THE NAMBLAREGION (TEHSILURI) UNION TERRITORY OF JAMMU KASHMIR(INDIA)

***Insha Javed, *Savneet Kaur, **P.G Scholar, **Assistant Professor**
*Department of Environmental Science
**Department of Chemistry and Environmental Science, Desh Bhagat University, Mandi Gobindgarh-147301

Abstract
Water is an important natural resource on plane tearth.About 71 percent earth surfaceis covere dby water includes oceans, glaciers, ice caps, lakes ,streams and underground reservoir. Waterquality and quantity both are important for exsistence.Water quality plays an important role inallsectors include agriculture, domestic, industrial etc. Fresh water resources like stream s provide varied ecological benefits and supporting freshwatera nd flourishing streamside ecosystems. Nambla stream and its catchment areas have been inhibited by human settlements which can possibly affecting a ecosystems in the sourroudingarea. Therefore, the objective of this study was to assess and evaluate the possible effects of anthropogenic disturbances, particularly changes in some water quality parameters. This study analysed the anthropogenic and seasonal footprints on the physio chemical parameters ofNambla stream. The drinking and irrigation water quality in the stream water was done withthe aid of using drinking WHOstandards.. Water samples were collected from various sitesfrom the stream for conducting various water parameters which include Temperature, pH,TDS, EC, turbidity, total hardness, free CO2 , total nitrogen, dissolved oxygen, total alkalinity. There sult srevealed that the value so fallwater quality parameters for all four selected sites of Nambla stream sites were mostlyin good condition.For sometime and points of the measurements, several parameters were found to be above the official water quality standards dueto theintensive anthropogenic activities,particularly at site 3& 4.
Keywords: [Physio chemical parameters, aquatic, anthropogenic activity, waterstream,waterresource,titration]

Introduction:

Surface water is indispensable reservoir of drinking and plays vital role in the survival and sustainability ofplants, animals, and humans (Alvizuri Tintayaetal.,2022; Verma and Jamwal,2022). Due to rapid development and population expansion, water depletion and quality deterioration occur not only with natural processes (Muhammad and Ahmad, 2020) but also with anthropogenic activitie s such as human settlements, industry,urbanization,and agriculture(Gupta and Chinnasamy,2022).With industrialisation and urbanization water pollution of the

environment has been caused by mobilization and movement of water pollutants in the waterbodies which have considerably increased since the 1940s (Khan et al., 2004). Their primary water pollutants come from human sources such industrial wastes from mining, smelting, andagricultural practices such as the use of pesticides and phosphate fertilizers. Their natural pollutants in the environment include weathering of metal-containing rocks and volcaniceruptions (Spiegel,2002). According to the report from Environment Protection Agency (EPA) 1990 that leaching and mixing of chemicals from agricultural practices account for >50% ofthe water contamination in streams and rivers (J.L. CooK et al, 1990). The health o f residentswhouseriverandstreamwaterastheirlastsource ofwaterisatriskfromanytypeofpollution,direct or indirect.From ages human societies have been interested in fresh surface waters,especially in drinking water supply. Even today we see most of agricultural, urban, andindustrial centres have been built close to water bodies to make use essential use of watersources(Sánchezetal.,2007).Waterisvitalforcellula rmetabolismandappropriateoperation,hence contaminated and polluted water can cause adverse effects on humans and other farmsof life.(Alam et al., 2017). Therefore, it necessitated to decide us to to check stream waterquality parameters and pollution levels in selected Nambla stream which flows in the Uri area of district Baramullain union territory of Jammu and Kashmir. Stream water bodies are one ofthe sources of water in river, pond, and lake ecosystems and maintain the ecological balance.Stream watersprovides drinking water, irrigation for crop, recharging ground water andsupporting wildlife even some aquatic animals seasonally breed in freshwater streams such asamphibians and freshwater fishes have also main habitat of stream water bodies. The freshNambla stream has multiple sources of contamination which includes human settlements and agricultural run off hasurged assessing its waterquality parameters.

Study area

The valley of Kashmir is well known for its freshwater resources and the river Jhelum is mainlife line of the Kashmir. Many major streams pour freshwaters into the Jhelum increasing itswater content at various places throughout its length. Nambla village is located 7 kms awayfromsubdistrictUritehsiland52kmfromdistricthea dquartersBaramulla.Itstotalgeographical area is 1195 hectares. Nambla is a census village in Baramulla district of Jammuand Kashmir India. As per census 2011 of India Nambla has total population of 7193 peoplewithaliteracyrateof44percent.TheNamblastream originatesfromconsiderabledistanceof15 km from Kandi mountains. The source of water is melting glaciers and springs which originates.The gradual tha wing of snowing with onset of summers gives it a fresh watersource flowing down from foot hills of Kandi Mountains and finally ending up in river Jhelum near Gurduwara Chattipadshahi. In the present study 4 sites were selected for assessing various physio chemical parameters of stream water. The samples from selected sites were collected in1 litre polyethylene plastic bottles fitted with screw caps. For other parameters, samples were preserved by adding an appropriate reagent & brought to the Lab for detailed chemical analysis.

Site1

Site 2

Site 3

Site 4

2. MATERIALSANDMETHODS

Water samples were collected from the stream by dipping one-liter polyethylene bottle justbelow the surface of water. Temperature, depth, transparency was recorded on the spot, whileanalysis of other parameters was done in the laboratory within 24 hours in accordance withGolterman and Clymo (1969), A. P. H. A. (1998), Mackreth (1963). Water temperature (Co)was recorded by a Celsius thermometer. Transparencyby standard Secchi disc (20 cm dia.)Depth of stream was recorded by sounding the stream bottom with a standard metallic weight(1Kg) attached to a marked rope. pHwas determined by a digital pH meter (US make. Conductivity– It was recorded by a digital conductivitymeter(USmake).Dissolvedoxygenwas determined by titrimetric methodsby Winkler's method. Free CO2 was doneby NaOHtitration. Total Alkalinity was also estimated with titrimetric method by acidimetric indicatorendpoint. Nitrate Nitrogen was done spectrophotometrically by Salicyclate method (CSIR,Pretoria,1974).

3. RESULT & DISCUSSION

As mentioned above in the present study water quality parameters were determined in the field and all the measurements were evaluated with standard procedures. The field measurement data was obtained to uncover the current status of some water quality parameters, which was one of the important out comes of our study and the results are given below.The parameters of temperature(Co), EC(mS/cm),andTDS (mg/L),pH show very strong positive relations.

The temperature of the water instream was affected by variables such asaltitude,climate and stream flow as shown in Figure 1. Fluctuations in water temperature are governed mainly byatmospheric temperature.In addition, as pointed out by Hanafiah et al. 2018, various humandisturbances that particularly damage or decrease the natural vegetation cover along thestreams might also impair the water temperature, especially in the middle and lower portionsofthecatchments wherehuman-induced impactsareintense.

ThemonthlychangesinpHvaluesofboththestreamwaterfluctuatedfrom6.84SiteIVto 8.26forSiteIIasshownfigure3.MaximumpHwasfoundinthemonthofJuneandminimuminthemonthofFebruary.Ingeneral,pHvaluesrangingbetween6.5and8.5areidealforbothnaturalanddrinkingwaters(WHO,2017).Themainreasonforbothoftheseextremep Hvaluescan be directly associated with the agricultural activities and pollution from catchments areas. Transparency (cm) In the upper reaches water wastra nsparent as the bottom was clearly visible and sunlight reached bottom while downstream it was turbid. The highest transparency i.e.,100% was found at Site I, II and III while lowest transparency was found at Site 4 in all the 5months.

Electrical conductivity (EC) is the ability of waters ystemsto transfer electriccurrent, depends on the amount of dissolved ions and inorganic dissolved solids (Hanafiah et al. 2018). Itfluctuated between a low of 89 úScm-1 at Site I in the month of April to a high of 329 úScm-1for Site IV in the month of February as shown in figure 2. It was reported in previous studies that electrical conductivity could be an indicator to provide data about the amount of dissolve dsubstances and pollution level sin surface water systems (Tas¸demir,2001).

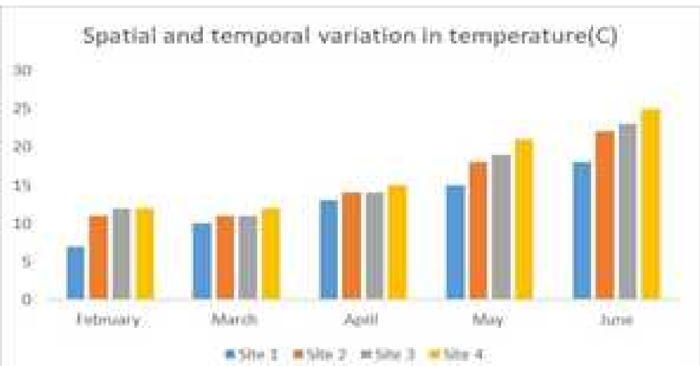

Figure1

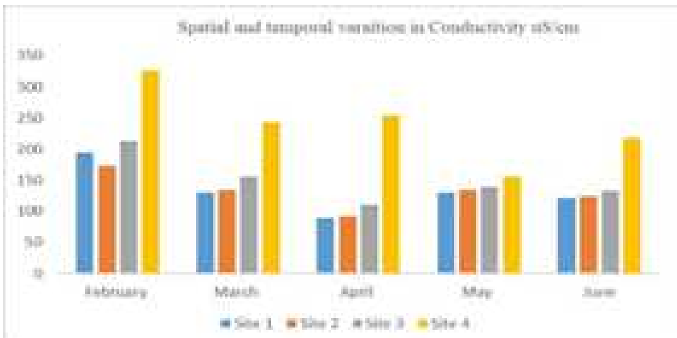

Figure 2

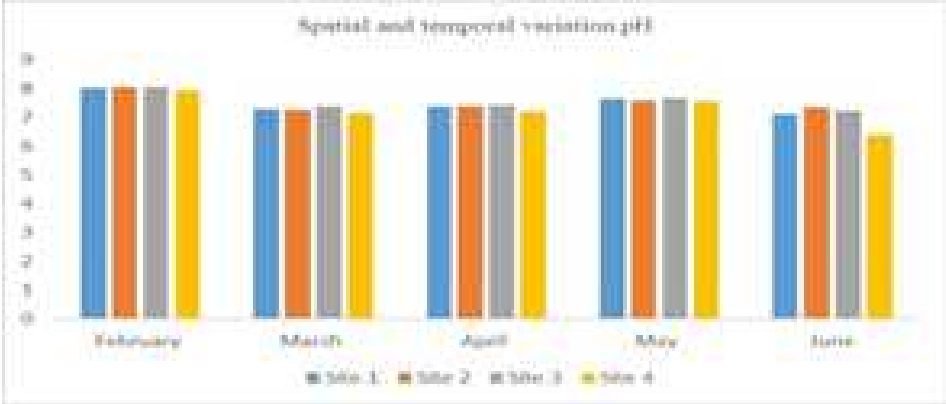

Figure 3

Dissolved oxygen and other gases like carbondioxide in stream water change depending on partial pressure, temperature, salinity, respiration, and photosynthesis (Ravindraetal2022). It's well known that water's dissolved oxygen level regulate s chemical and biological processes (Allan & Castillo2007).Dissolved oxygen, one of the most significant characteristics in water quality, should be between 8 and 14 mg/L in natural freshwaters and dropping below 5 mg/L becomes harmful to livingthings(Chapman,1996).With in this catchment receives significant amounts of both sewage (raw and treated, human and nonhuman) and agricultural runoff (Brusseauetal2019) .The present investigation revealed the DO content ranging from 4.9mg l-1to 14.3mgl–1as shown in figure 4.The highest DO content was recorded at Site II in the month of March and lowest at Site IV in the month of April. The free CO2 value ranged from 2 mgl-1to 17 mgl-1. The maximum free CO2 content was recorded at Site IV in the month of February& May and minimum free CO2 was recorded at Site I and in the months of June as shown infigure5

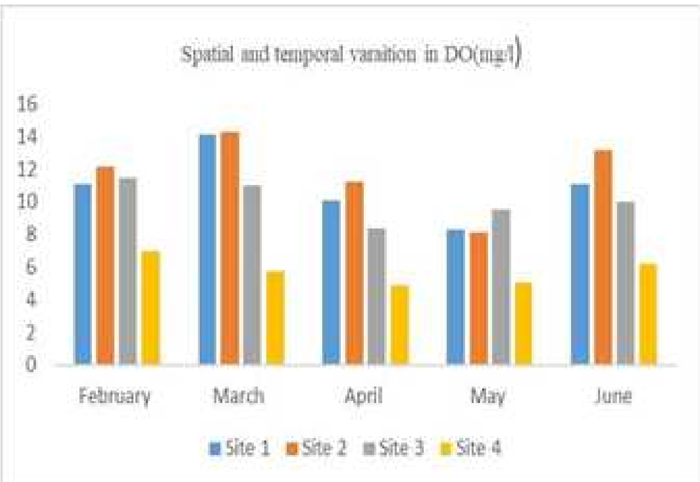

Figure 4

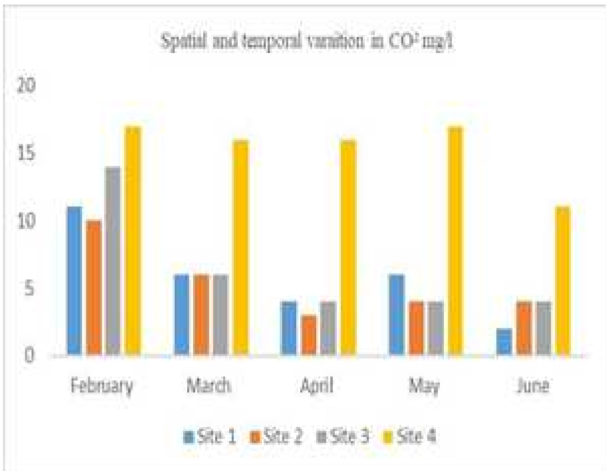

Figure 5

Chloride in water is generally due to salts of sodium, potassium and Calcium. The maximumvalue of Chloride 9.2 mg/l was found at Site IV in the month of June and minimum value of 4mg/lat SiteI , II,IVinthemonth of Marchand Junegiven in Figure6.

Calcium Hardness (mg/l) Ca2+ Hardness varied between a low of 40 mgl-1 to a high of 132mgl-1. Ca2+ hardness reached the maximum level for SiteIV in the month of April and minimum value for Site I in the month of April. Total Hardness (mg/L) Like Ca and Mg Hardness, Maximum value of total hardness was found at Site IV. The total Hardness was highest in the month of February for SiteIV(130mgl-1) and lowest in the month of March for

SiteI(37mgl-1) in figure 7. Calcium is generally the dominant cation in Kashmir waters, especially lakes(Zutshi et al., 1984). Magnesium was much lower than Ca++ as shown in figure 8. The concentration of Ca++ and Mg++washig her as compared to other cations and the usual progression of there was Ca++> Mg++> Na+> K+. Ca++ and Mg++ content showed trend similar to that of total hardness concentration increased downstream as shown fihure 9.. The increased total hardness, Ca++andMg++downstream can be related to anthropogenic interference in the neighbourhood. Besides this, it can be related to sediment characteristics particularly at SiteIV, which is located in the neighbourhood of ChattiPadshahi Gurduwara.

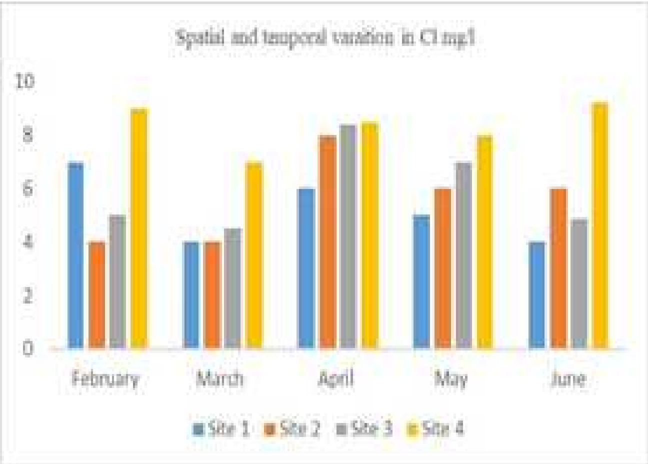

Figure 6

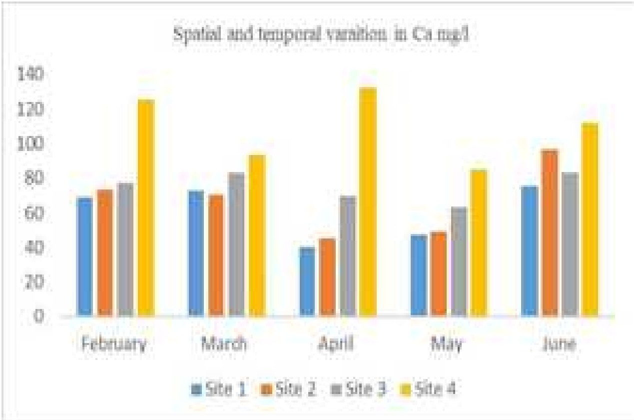

Figure 7

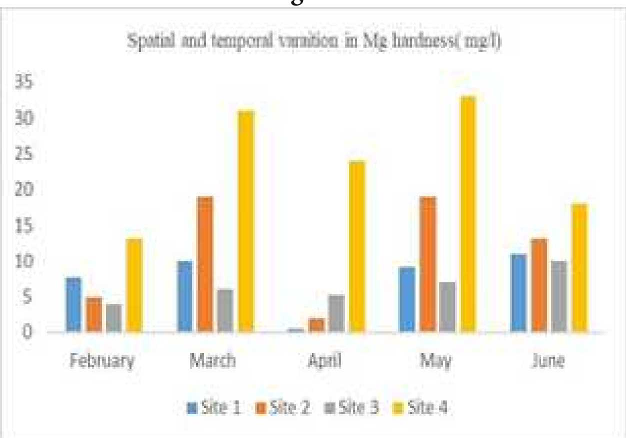

Figure 8

Figure 9

Nitrate nitrogen (NO3-N) (µg/L) The present investigation revealed that Nitrate - nitrogencontent ranged from 123 úgl-1 to 901 µgl-1 as given in figure 11.The maximum value wasrecorded in the month of June at Site IV while as minimum value was recorded in the monthof April at Site I. The Nitrate - nitrogen reached the maximum level at Site IV in all months. However, recently, their concentrations have been driven up by anthropogenic sources such as agricultural fertilizers, human and animal waste (Hamid et al 2019). They can reach streamecosystems through either point sources (e.g. municipal and industrial wastewaters) or asnonpoint sources (e.g.fertilizers and manure from farm fields(Das,etal2023),mostlybysurface and subsurface runoff. (Zhou, et al 2016). In natural waters, nitrate is formed by theoxidation of ammonia, resulting from the decomposition of animal and vegetable wastes, thedissolution of fertilizers, and the conversion of nitrogen into nitrogen oxides as a result ofelectrical discharges in the atmosphere [Davie &Gerrard, 2008)]. When the results of thepresent study were investigated, it was found that nitrate levels generally increased from thesourceto theriver mouth

Total Alkalinity (mg/l)is a measure of buffering capacity of water. The total alkalinity at allthe sites was entirely due to bicarbonates. The bicarbonate alkalinity was highest in the monthof February (121 mgl-1) for Site IV and lowest also in the month of April (37mgl-1) for Site IIIas given in figure 10. In streams the occurrence and abundance of components of bicarbonatesystem and the pH condition are determined primarily by current biological process andchemical nature of the substrate (Reid, 1961). During the study period the stream was foundalkaline except at Site IV, where often it was found less alkaline. Vasisht and Sra (1970) havereported high pH in unpolluted and low in polluted waters. Low pH at Site IV may be due to various pollution stresses. The acidification of water ways is being recognized as one of the big problems. Total alkalinity is a measure of carbonate content of water or temporary hardness expressed in terms of CaCO3.Ca and Co2 are are sultant of the entire biological and chemicalsystems of water. Thus, the total alkalinity has been used as a rough index of productivity of water(Moyle,1956). The lowest average value of total alkalinity was found inApril.Alkalinity of water increased downstream

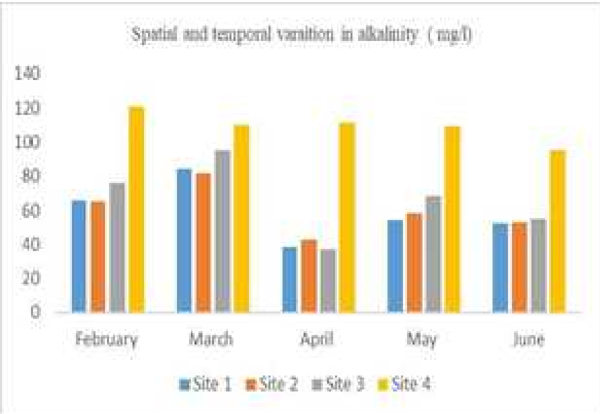

Figure 10

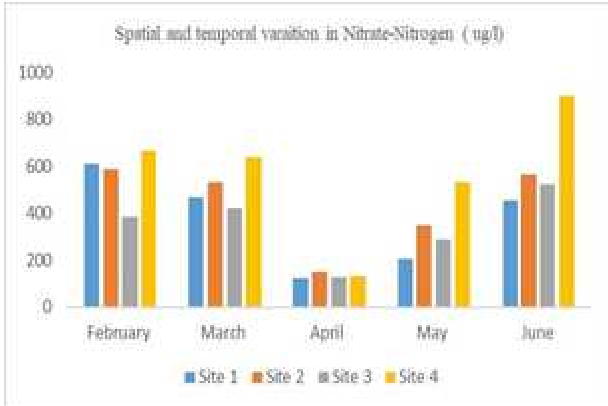

Figure 11

.CONCLUSION

Many human-induced interventions have occurred within the catchemnet of Nambla stream including the several human settlements as well as new accessroads, the conversion off orested lands to settlement and agriculture are asis affecting the stream..Thus, the primary goal of this project was to record and evaluate monthly values of several water quality parameters, and suspended sediments in the stream and assess how these parameters these parameters vary with time and location. Upstream the water was medium soft water type and downstream due to anthropogenic activities the water quality changes to hard water type. D.Olevel in upstream remain at higher level due to low depth and least anthropogenic interferences and as the stream goes down and added wastes from settlements and picnic places the D.O level goes decreaseddue increased consumption of oxygen by bacteria in decomposing organics. Nallah Namblastays mostly un polluted how ever due to increasing population in adjacent are as and recreational activities ares lowly adding pollutant loads in its waters making it highly susceptible to modern pollution. This research will provide critical knowledge that will serveasthefoundationforthe proper use and management of theNambla streamas watersource.

REFERENCES

1. Alvizuri Tintaya, P.A., VillenaMartínez, E.M., Mic´oVicent, B., Lora Garcia, J.,Torregrosa-L´opez, J.I., Lo-Iacono-Ferreira, V.G., 2022. On the road to sustainablewatersupply:reducingpublichealthrisksandpreservingsurfacewaterresourcesinthemillunimicro-basin, Bolivia. Environments9 ,4.https:// doi.org/10.3390/environments9010004.
2. Verma, R., Jamwal, P., 2022. Sustenance of Himalayan springs in an emerging watercrisis.

Environ.Monit.Assess. 194, 87.https:// doi.org/

10.1007/s10661-021-09731-6.

3. Gupta, M., Chinnasamy, P., 2022. Trends in groundwater research development in the south and southeastasian countries:a50-years bibliometric analysis(1970-2020). Environ. Sci. Pollut. ControlSer.29,75271-75292. https:// doi.org/10. 1007 /s11356022-21163-4.
4. Muhammad, S., Ahmad, K., 2020. Heavy metal contamination in water and fish of theHunza River and its tributaries in Gilgit-Baltistan: evaluation of potential risks and provenance. Environ. Technol. Innovat.20,101159https://doi.org/10.1016/j.eti.202 0.101159.
5. Sánchez, E., Colmenarejo, M.F., Vicente, J., Rubio, A., García, M.G., Travieso, L.,Borja,R.,2007. Use of thewater quality index and dissolved oxygen deficit as simple indicatorsofwatersheds pollution. Ecol. Indic. 7(2), 315-328.
6. Khan, F.U., Rahman, U., Jan, A., Riaz, M., 2004. Toxic and trace metals (Pb, Cd, Zn, Cu, Mn, Ni,Co and Cr)indust, dust fall/soil.J.Chem. Soc.Pak. 26 (4),453-456.
7. Spiegel, H., 2002. Trace element accumulation in selected bio indicators exposed to emissions along the industrial facilities of Danube Lowland. Turk.J.Chem.26(6),815-823.
8. J. L. Cook, P. Baumann, J. A. Jackman and D. Stevenson, "Pesticides Characteristics that Affect Water Quality". http://insects. tamu.edu /extension/ bulletins/water/water_01.ht ml [Citation Time(s):16]
9. Alam, M., Dafader, N., Sultana, S., Rahman, N., Taheri, T., 2017. Physico-chemicalanalysis of the bottled drinking water available in the Dhaka city of Bangladesh. J.Mater.Environ.Sci. 8, 2076-2083.
10. Golterman, H. J.andClymo, R. S. 1969. Methods for Physical and Chemical Analysisof Freshwater. IBP Handbook No. 8. Blackwell Scientific Publication, Oxford, EdinBurgh
11. Mackereth, F.J., Haron, J. and Talling, J.F.1978.Water analysis. Fresh water Biol. Assot. Sct.Publ. No.36.
12. APHA, 1998. Standard methods for the Examination of water and waste water. 20thedition.AmericanPublic Health Association Washington D.C.
13. M.M.Hanafiah,etal.,Waterqualityassessmentof TekalaRiver,Selangor,Malaysia,Appl.Ecol. Environ. Res.16 (4)(2018) 5157-5174.
14. WHO, Guidelines for Drinking Water Quality: Fourth Edition Incorporating The First Addendum, Available from:,2017 https:// www. who.int/ publications/i/ item/ 9789241 549950.
15 M. Tas¸ demir, Z.L.G¨ oksu, Asi Nehri'nin (Hatay, Türkiye)Baz? SuKalite¨Ozellikleri, E.Ü.Su Ürünleri Dergisi 18(1-2) (2001)55-64.
16. B. Ravindra, N. SubbaRao, E.N. Dhanamjaya Rao, Groundwater quality monitoring for assessment of pollution levels and potability using WPI and WQI methods from apart of Guntur district, AndhraPradesh, India, Environ. Dev. Sustain. (2022).
17. J.D.Allan, M.M. Castillo, Stream Ecology: Structure and Function of Running Waters, Chapmanand Hall, 2007.
18. D. Chapman, in: Water Quality Assessments - A Guide to Use of Biota, Sediments and Water in Environmental Monitoring, seconded., UNESCO/ WHO/UNEP,London,UK,1996.
19. M.L. Brusseau, D.B. Walker, K. Fitzsimmons, in: M.L. Brusseau, I.L. Pepper, C.P. Gerba (Eds.), Chapter3-Physical-Chemical Characteristics of Water, thirded.Environmental and Pollution Science, Academic Press,2019, pp. 23-45.
20. Hamid, S.U. Bhat, A. Jehangir, Local determinants influencing stream water quality,Appl.WaterSci. 10(1)(2019).
21. R. Das, etal., Nitrate contaminated ground water and its health risk assessment in semi-urbanland,

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Phys.Chem. Earth, PartsA/B/C(2023).

22. Moyle, J.B. 1945. Some chemical factors influencing the distribution of aquatic plants in Minnesota Amer.Midland Nat. 34: 1-34.

23. Reid, G.K. 1961. Ecology of Inland water sand Estuaries: Reinhold Publishing Corporation, NewYork.

24. Vasisht, H. S. and Sra, G. S. 1979. The biological characteristics of Chandigarh wastewaters in relation to the physico-chemical factors. Proc. Symp. Environ. Biol. 429440.P.

25. Zhou, etal2016)., New insight in to the correlations between land use and water quality in a coastal watershed of China: does point source pollution weaken it? Sci. TotalEnviron.543 (PtA)(2016) 591-600.

26. T.Davie,in: J.Gerrard (Ed.), Fundamentals of Hydrology, seconded.,Routledge,NewYork,2008.