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Assessment of phytoplankton and water quality in the Pravara River: An impact of human indiscriminate behaviour

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***Abstract*---**An attempt has been made to identify instream Phytoplankton and its impacts on the water quality of the Pravara river. The main aim of this research work is to analyse Phytoplankton abundance and its impact on water quality of the Pravara River water, for which water samples from 08 sampling stations from stream have been collected during 1st week of Jan 2022. Physico-chemical parameters have been analyzed by standard method. The Field observations reveal that enhancement in human activities water deterioration also increased. It is all due to indiscriminate behaviour of the human being. Many human activities necessary for survival but it declined water quality. Study also reveals that in the study area due to deterioration of water quality phytoplankton abundance has been observed. At the dadh, Ashwi, Punatgaon, Toka due to phytoplankton water is not fit for drinking purpose. To analyze Phytoplankton abundance and Physio-chemical characteristics of water is the main aim of the research with remedial measures to mitigate the deterioration and related consequences in future.

***Keywords*---**Pravara River, Phytoplankton, Water Quality, Physico-chemical Analysis.

Introduction

Now-a-days everyone is worried about pollution of rivers, which is cause by extensive use of fertilizers and chemicals in the field of agriculture and development of various industries (Kumar et al.2007). The most important serious problem is liquid and solid waste material due to which water surface gets

contaminated. It is resulted in the degradation of water quality of river, making it useless for various uses (Akhtar et al.2021). So it is necessary to assest the aquatic environmental quality and also to determine how water quality is affected due to the contamination from various indiscriminant activities of human (Ali Eqani et al. 2012). This hydrological water quality assessment is very helpful in various interpretations (Alberto et al. 2001).

Biological monitoring is most important concept in the science of environment (Karr 1987). Biological monitoring means, with the help of living organism, assessment of environmental contamination takes place, to determine changes and the effect of biotic, chemical and physical factors in the environment. There are so many biological species; Population of this group of species can be use to assest environmental purity. They are also called as bio-indicators, used as a detector of healthiness of environment (Desrosiers et al. 2013). Phytoplankton works as very effective bioindicators because they are very sensitive to various changes in environment (Fonge et al. 2012). Phytoplankton includes number of species which belong to the order chlorophyceae, euglenophyceae, bacillariophyceae and cynophyceae (Ganai et al. 2014).

Phytoplanktons are related to different physico- chemical characters of the water. For e.g. Total alkalinity of water, dissolved oxygen, total hardness of the water, electrical conductivity of the water and biochemical oxygen demand of the water. Due to various global changes in environment, there is disappearance of so many phytoplankton species in many areas (Hillebrand et al. 2018) .

This present study is for assessment of phytoplankton and existing water quality in Pravara River and their seasonal changes also and how human's indiscriminate behavior affects on it (Kumar 2002). Pravara River carries lots of flora and fauna, so having most productive biodiversity hotspots. But the intense indiscriminate human activities break down the utility and quality of water (Karmakar et al. 2022). Phytoplanktons are one of the most essential bioindicators found in pravara river ecosystem. In different developing countries, regular assessment of phytoplanktons is the very important method for the assessment of quality of water (Wu et al. 2019). They are very much sensitive to the changes in the temperature, levels of light, nutrient levels, pollution; phytoplankton indirectly controls all type of production in river ecosystem. They play important role in river ecosystem as primary producers and biological indicators (Paerl et al 2003). They can develop and survive in adverse environmental conditions. There is very rapid change in phytoplankton because of their fast regeneration and short life span (Barber et al. 2006).

Pravara River was subjected to various activities, which are anthropogenic, out of which sand mining is very illegal and indiscriminate. So the main important objective of this research is the assessment of water quality and diversity of phytoplankton in relation to various indiscriminate humans' activity.

Study Area

Pravara River is a smallest and major right hand tributary of the Godavari River. It is an important drainage system of Ahmednagar district mostly northern part

of the district is drained by Pravara River. The basin lies between 19° 00' to 19° 45' North latitude and 73°45' to 75° 00' East longitude. The elevation of the basin ranges from 460 meter to 1646 meter ASL. The drainage network is sub dendritic pattern, covering 6,537 km² area of the district. The river rises at an elevation of 1295.4 meter in the eastern slope of Sahyadri between high peaks Kulang and Ratangad. River Pravara flows about 217 Km in east direction with 7 th stream order. It flows through Akole, Sangamner, Rahata, Shrirampur and Newasa Tehsils of the Ahmednagar district.

The area is covered by basaltic lava flow related to Deccan volcanic activity of late cretaceous to Eocene period. The area is dominated by Black cotton (*Regur*) soil. Alluvium deposits are developed along main stream which is good for cultivation of sugarcane, pulses, fodder and fruits. The study area is representing semi-arid climate and comes under Western Maharashtra Scarcity zone. The distribution of rainfall is mostly uneven the western part of the study area receives highest rainfall but in eastern part it is more erratic. The average annual rainfall of the area is 501.8 mm. Natural vegetation in the study area represents the southern tropical dry deciduous type.

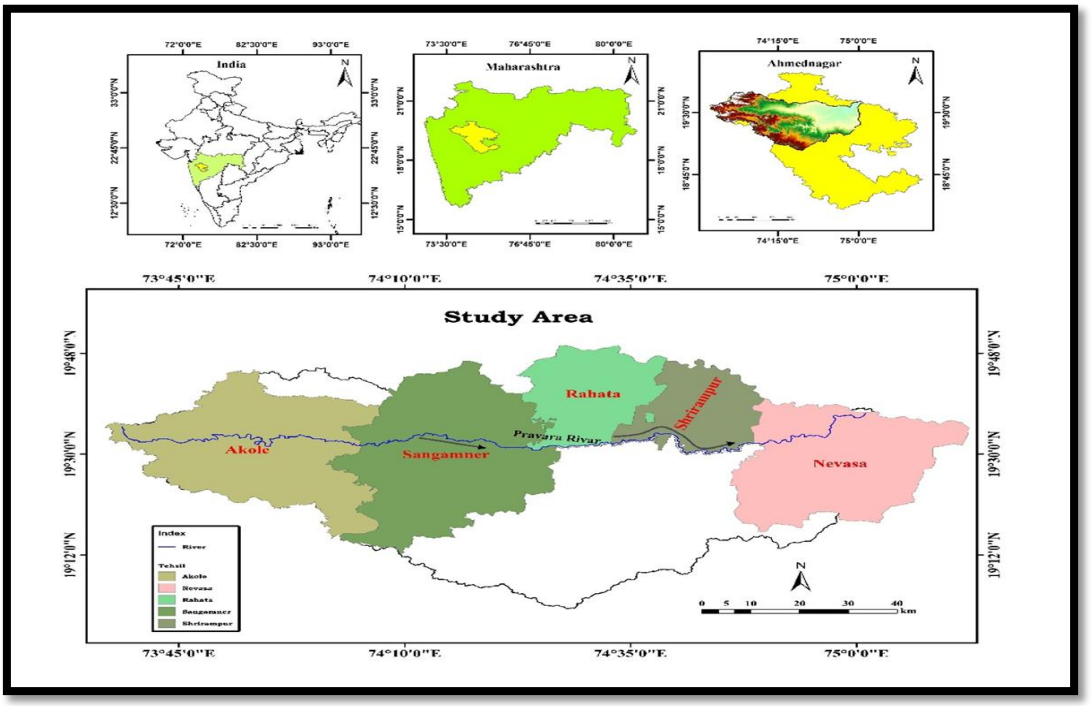

Figure 1 Location of the study area

Materials and Methods

Study Sites

The study was carried out at Pravara River. For the systematic observation of entire channel SOI Topographical maps (47/I/1,2,3,6,7,10,11,14,15 and

47/E/10,11,12,13,14,15, on 1:50000 scale) have been studied. It can help to understand the morphology, physiography and general observation of the study area. Field observation also has been done for understanding human interventions along stream. For furture study 08 sampling stations have been selected from entire stream. Selection of sampling stations is based on human activities and phytoplankton abundance. Major activities within the sites are sand mining, brick kilns, domestic, Agricultural and irrigation practice so sites along Pravara River namely Kasara Dumala, Sangamner Khurd, Jorve, Dadh, Ashwi, Punatgaon, Pathare and Toka have been selected.

Physico-chemical Variables

Various Physio-chemical parameters like pH, Dissolved oxygen (DO), BOD and Electrical conductivity were analyzed for the evaluate the impact of human activities and Phytoplankton abundance on water quality. Water samples have been collected from the surface water along river during Jan 2022 for analysis. Temperature and pH of samples have been measured at in the field during collection. The water samples were analyzed at Water Quality Laboratory level- II, Nashik under Hydrology Project, Water resources department, Government of Maharashtra. The analysis was carried out in the laboratory as per BIS standard methods. It all information summarize and analyzed with the help of graphs.

Phytoplankton Sample

There is a special device called as phytoplankton Net or it is called as sampler, which helps to collect phytoplankton. We attach that net for collection at the back side of our boat. By throwing the net sample of phytoplankton was taken from the surface of the water at the depth of 0.20 m. Immediately this sample collected, were mixed with buffered formalin (0.4 lit) by pouring in a plastic container. Identification was done in a laboratory with the help of different guides. With the help of binocular microscope (Olympus) at the magnification of 1000X model eas – XSZ-107E.

Data Analysis

All types of data analysis was takes place using software statastical package for social science (SPSS). Different variations in environmental conditions, and data of phytoplankton were statastically tasted by using analysis of different values and varience. Highest phytoplankton abundance is basillariophyceae (43.1 %), and lowest phytoplankton abundance is cynophyceae and phyrrophyceae (9 %)

Results and Discussion

Phytoplankton Abundance

Quantitative measurment of phytoplankton abundance were done by counting each species individuals and by counting number of individuals per lit of sample. For thecalculation of biomass, different equations which are based on different formulas of geometry. We can calculate estimation of phytoplankton diversity and richness of species. Biomass can be calculated indirectly from the specific volume

of cell of density of perticular taxa. We can express phytoplankton abundance as biomass or colony numbers. In summer, because of incresed in water temparature, consumption of nutrients by phytoplankton decreses. It decreses phytoplankton diversity andabundance (TableNo.1)

Table 1
Phytoplankton class and percentage abundance

Sr.No	Class	Percentage abundance
1	Baccilariphyceae	43.1 %
2	Cryptophyceae	19 %
3	Chlorophyceae	22.2 %
4	Dinophyceae	1.4 %
5	Cynophyceae	9 %
6	Euglenophyceae	15.7 %
7	Crysophyceae	0.9 %

Water Quality Analysis

Physicochemical parameters of the water are important in identifying the type, quality and nature of the water [Egbueri et.al 2019]. The physicochemical characteristics of the water of the study sites are presented in the Table No.1. The water samples at various stations were tested for various parameters like temperature, pH, DO, BOD and Electrical conductivity was determined

Table 2
Physico-chemical Parameters of the Pravara River

Sr No	Place	pH	DO(mg/l)	BOD(mg/l)	Electrical Conductivity (µS/cm)
1.	Kasara Dumala	5.4	5.8	3.4	857.1
2.	Sangamner Khurd	5.5	5.6	3.6	867.3
3.	Jorve	5.7	5.5	3.5	862.4
4.	Dadh	6.1	4.9	4.1	823.5
5.	Ashwi Khurd	5.8	5.2	4.1	824.7
6.	Punatgaon	5.6	5.1	2.5	856.8
7.	Pathare	5.9	5.3	3.4	846.7
8.	Toka	5.8	5.4	4.5	835.4

pH

It is one of indicator of water quality(Sharip etal 2020) pH suggests whether water is acidic or basic(Glein etal 2015) It can be seen from above table that pH is in range of 5.8 to 6 This pH range is found to be suitable for growth of phytoplanktons (El-Gendy etal 2004)

Dissolved Oxygen [DO]

Dissolved oxygen (DO) is the amount of oxygen that is present in water. (Baxa et al., 2021) Water dissolves oxygen from the atmosphere and also receives it from aquatic plants. Running water, such as river, stream, dissolves more oxygen than the stagnant water (Bhateria et al., 2016) DO speaks about quality of water It is responsible for survival of aquatic life (Herbig etal 2019) DO level too high or too low can be harmful to aquatic life and affect water quality. (El-Sheekh etal 2016) The vegetation cover does not allow oxygen from the air to get dissolved in the water therefore DO value of water decreases (Díaz etal 2012)

Biological Oxygen Demand (BOD)

It indicates amount of oxygen required to degrade organic matter present in water (Hussain, etal 2021) Algal blooms and other phytoplanktons prevent sunlight from entering water bodies and reaching it to other plants in water body So plants die and oxygen levels decrease and BOD values increase Pravara river at Dhad, Ashwi Khurd and Toka has algal bloom and hence have large value of BOD.

Electrical Conductivity (EC)

Electrical conductivity is the ability of water to conduct an electrical current (Belov etal 2019) The higher the concentration of dissolved salts in the water, the greater the current it can conduct. (Shah etal 2017) It is observed that EC of water at selected sites is found to be in range of 823 to 867(μS/cm)

Conclusion

It was noticed that, when river shows heavy flow of water, in that situation, number of phytoplankton is very less. This situation is observed in Pravara River during monsoon, when water flows very heavily. During winter number of phytoplankton increases and in summer season, we can observe highest number of phytoplanktons. May be during summer, with so many bright sunlight, planktons will get so many nutrients for their proper growth. We also observed that sunlight and temperature also shows effect on the growth, abundance and dominance of the phytoplankton in Pravara River. It also observed that due to K.T. weir water flow become stagnant, it also bloom the phytoplankton. All the abundance of phytoplankton affects on water quality.

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