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Phytoplankton Diversity of Anas River at Jhabua, Madhya Pradesh, India

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ABSTRACT

Water is the basic basis of life, without which life cannot be imagined, not only for human beings but for every living being. Water serves as a habitat for phytoplankton.Present investigation has been conducted on Anas River at Jhabua (M.P.). Phytoplankton sample collected monthly from four sites of Anas River and preserved in Lugol's Iodine solution and analyzed in laboratory. During the entire study period of year, a total of 34 phytoplankton species belonging to 18 orders. Phytoplankton of this Anas River consisted mainly of Chlorophyceae, Bacillariophyceae, Cyanophyceae, Euglenoideaand Zygnematophyceae. Phytoplankton population represented by Chlorophyceae group followed by Bacillariphycae, Cyanophyceae and Zygnematophyceae, Euglenoidea.

Introduction

Jhabua district is located in the western part of M.P., covering an area of about 3,782 square km. Jhabua district is mainly a hilly region which extended between the parallels of North latitudes 210 55' 23" and 230 17' 18" and between the East longitudes 740 01' 52" and 750 00' 52". The district is bounded in the North by Ratlam district of M.P., in the East by Dhar district of M.P., and the West by Dahod district of Gujrat and Banswara district of Rajasthan, and in the South by Alirajpur district of M.P. Present investigation has been done on Anas River which arise from Gram Foot talab in Jobat and flow cross the Jhabua to Gujrat and meet Mahi River. Plankton are free floating living being, which is unable to maintain their movement and distribution against water current. Victor Hensen (an oceanographer) gave the term Plankton in 1887. Plankton can be classified into two types according to their origin; Phytoplankton and Zooplankton. Phytoplankton are plant origin, which are autotrophs, while zooplankton are animal origin and are heterotrophs depend for their food on phytoplankton and other zooplankton.

Material and Methods

Study Area

River is main water resource for Jhabua district and large tributary of Mahi River. The present investigation was carried out in Anas River for period of two year from July 2020 to June 2022.

Sampling stations

Water samples were collected from Anas River while passing from 50 km around Jhabua city (Dharampuri, Kishanpuri, Rangpura, Amarpura (Antarveliya)).

Sampling Method

For the study of phytoplankton, water samples were collected from the sub-surface using bucket and plankton net and stored in double-stopper bottle. Lugol's Iodine solution is used as preservative. In the laboratory sub-samples of 10 ml of

this preserved sample was taken and centrifuged for qualitative and quantitative analysis. one drop of concentrated sample was taken on the slide and observed under microscope for quantitative analysis using Sedgwick plankton counter. Phytoplankton were observed in 100 X in the binocular microscope. Standard books will be followed like Edmondson (1959) and Needham and Needham (1962) for identification of phytoplanktons.

Results

During the entire study period, a total of 34 phytoplankton species belonging to 18 orders were identified. Phytoplankton of the Anas River consisted mainly of Chlorophyceae, Bacillariophyceae, Cyanophyceae, Euglenoidea and Zygnematophyceae. Chlorophyceae consisted of 13 species, which are *Oedogonium sp., Pediastrum duplex, Pediastrum simplex, Scenedesmus obliguus, Microspora, Tetrastrum sp., Volvox aureus, Protococcus sp., Chlamydomonas, Closteridium sp., Chlorella vulgaris, Actinastrum sp., Ulothrix sp.* and *Oedogonium sp.*, were more dominant form in 2020-2021 and *Pediastrum simplex* were more dominant form in 2021-2022. Bacillarioplyceae were represented by 9 species, which are *Fragillaria sp., Synedra sp., Navicula sp., Asterianella sp., Diatom sp., Rhizosolenia sp., Melosiravarians, Cyclotella, Cymbella* and *Fragillaria sp.* were more dominant form in 2020-2021 and *Asterianella sp.* were more dominant form in 2021-2022.Cyanophyceae consisted of 06 species, which are *Microcystis sp., Spirulina sp., Anacystis, Oscillatoria sp., Anabaena sp., Nostoc* and *Spirulina sp.* were more dominant form in both years.Zygnematophyceae consisted of 05 species, which are *Zygnema sp., Spirogyra sp., Closterium sp., Cosmarium, Staurastrumdejectum* and *Zygnema sp.* were more dominant form in 2020-2021 and *Spirogyra sp.* were more dominant form in 2021-2022. Euglenoidea consisted of 1 species, which is *Lepocinclis*.

During the study period of year 2020-2021, percentage of phytoplankton group and total number of organisms reported as Chlorophyceae 10125 (41.23%)> Bacillariophyceae 6778 (27.60%)>Cyanophyceae 3640 (14.82%)>Zygnematophyceae 3478 (14.16%)>Euglenoidea 536 (2.18%).

During the study period of year 2021-2022, percentage of phytoplankton group and total number of organisms reported as Chlorophyceae 9859 (39.27%)> Bacillariophyceae 6583 (26.22%)>Cyanophyceae 4980 (19.84%)>Zygnematophyceae 2953 (11.76%)>Euglenoidea 729 (2.90%).

During the whole study period, percentage of phytoplankton group and total number of organisms reported as Chlorophyceae 19984 (40.25%)> Bacillariophyceae 13349 (26.89%)>Cyanophyceae 8620 (17.36%)>Zygnematophyceae 6431 (12.95%)>Euglenoidea 1265 (2.55%).

Phytoplankton population represented by Chlorophyceae group followed by Bacillariphycae, Cyanophyceae and Zygnematophyceae, Euglenoidea.

Discussion

Phytoplankton depend on the nutrients present in the water resource such as PO_4 and Calcium. Along with maintaining the ecosystem, phytoplankton also play an important role in the human economy. Humans use many phytoplankton for their many purposes, such as spirulina and chlorella are commonly used as nutritional supplements. Uses in the form of supplements and fertilizers. At present, the increasing level of carbon dioxide remains a major problem for the world, which is also reduced by Phytoplankton. This information on the diversity of phytoplankton collected from the present study is expected to be very useful for better organization of fish-related integrated aquaculture and ultimately for aquatic ecosystems. Within water bodies, there are constant qualitative and quantitative fluctuations in the density of planktonic communities; It varies according to the nature of the aquatic system.

In The present work, a total of 34 phytoplankton species was recorded belonging to 18 orders. Phytoplankton of Anas River consisted mainly of Chlorophyceae, Bacillariophyceae, Cyanophyceae, Euglenoidea and Zygnematophyceae. Maximum density of phytoplankton was recorded in the summer month, while minimum density of phytoplankton was recorded in monsoon. The density of phytoplankton in summer was maximum because in summer the physicochemical parameter, transparency increases, which creates a favorable environment for the growth of phytoplankton, helps in photosynthesis. Whereas due to increase in intake of water and turbidity in monsoon, phytoplankton found to be low. similar was reported from the studies of Soni R. N. and Bhatt S. A. (2008), Amirthanayagi A.K. et al. (2016), Baghel R.S. (2017), Ferdoushi Z. et al. (2015). The maximum plankton density was observed in the month of July and minimum plankton density was observed during the month of January. Carol J. (2005) reported low phytoplankton production due to high turbidity.

In the present study, Chlorophyceae was showed positive correlation with Temperature, pH, Biological oxygen demand, Phenolphthalein alkalinity, Total alkalinity and Total hardness while negative correlation with Turbidity, Conductivity, Chemical oxygen demand and Magnesium hardness, Total suspended solid, Nitrate and Nitrite. Bacillariophyceaewas showed positive correlation with pH, Biological oxygen demand, Phenolphthalein alkalinity, Total alkalinity and Total hardness while negative correlation with Temperature, Turbidity, Conductivity, Chemical oxygen demand, Total suspended solid, Magnesium hardness, Nitrate and Nitrite. Cyanophyceae was showed positive correlation with pH, Biological oxygen demand, Phenolphthalein alkalinity, Total alkalinity and Total hardness while negative correlation

with Temperature, Turbidity, Conductivity, Chemical oxygen demand, Total suspended solid, Magnesium hardness Nitrate and Nitrite. This was in accordance with earlier reports by Malik D.S., Sharma A.K. and Bargali H. (2018) reported the diatoms density shows negative correlation with turbidity. Sedmkar E.B. and Vasanthakumar B (2016) states that green algae positively correlated with Dissolved oxygen and negatively correlated with nitrate, phosphate. Sharma S., et al. (2011) Chlorophyceae has a positive correlation with total dissolved oxygen, and a negative correlation with temperature pH and phosphate. Cyanophyceae shows positive correlation with transparency, pH, alkalinity and dissolved oxygen. Suresh B., et al. (2011)noted that phytoplankton species diversity showed positive correlation with temperature, nitrate and phosphate but negative correlation with pH, BOD, nitrite and the richness showed strong negative correlation with nitrogen and with BOD and the dominance showed strong negative correlation with BOD whereas a strong positive correlation with nitrite.

Malik D.S., Sharma A.K. and Bargali H. (2018) The Shannon Wiener index of phytoplankton found in the Bhagirathi River was recorded at a maximum of 2.789 in January and a minimum of 2.288 in July. Suresh B., et al. (2011) reported diversity indices greater than 3 indicate clean water. Evenness index of phytoplankton species was observed to be higher during the summer and lower in rainy period during the study period.

Conclusion

Therefore, from the above study it was concluded that Chlorophyceaewas dominant in Anas River. The total plankton was minimum in monsoon and maximum in post monsoon in Anas River. In general, at all the sampling sites the quantity of phytoplankton was very low in monsoon. This may be due to heavy rain and flush of rain water in rainy season.

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