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Physicochemical Investigation of Wainganga river water with reference to Eutrophication at Kardha from Bhandara district

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Abstract:

Nothing in the make - up of our earth's system is more basic than the availability of water in its various states. The quality of water is of vital concern for mankind, since it is directly related with human welfare. Anthropogenic inputs of nutrients to the Earth's surface and atmosphere have increased greatly during the past two centuries. This nutrient enrichment, or Eutrophication, can lead to highly undesirable changes in ecosystem structure and function, however. All the limnological parameters indicate the higher trophic status of the river which can be attributed to high anthropogenic pressure that is the major cause of continuous deteriorating the ecological conditions of the river. Hence, present study has been undertaken to observe its Eutrophication status of Wainganga River, Kardha of Bhandara District and from January 17 to December 2017.

Key words: Eutrophication, Anthropogenic, Nutrients.

Introduction:

Rivers are important freshwater resources to mankind. Freshwater constitutes only 2.5 % of all freely available water on earth's surface, of which only 0.3 % is readily accessible in lakes, reservoirs and rivers. Environmental problems apparently occur in and around the rivers, pollution of river, lakes is increased due to the industrialization, agricultural waste increasing population and various anthropogenic activities of human being , waste water is deposited in to natural systems without proper treatment and it results in to the huge pollution of natural ecosystem. Sewage water is containing more than 80% of industrial waste run off through rainfall, agricultural runoff and urbanization run off and it is drained in to nearby lakes and rivers. It results in to the depletion of Oxygen

concentration and biological Oxygen demand and chemical Oxygen demand is resulted very high. Sewage disposal is major problem in most urban areas of India, waste water released from industries and sewage released in to streams and rivers.

In India most of the industries are situated at the river bank or lake side for availability of water and for deposition of waste water Lokhande, *et al., (*2011). The industrial waste deposited in river water and again the agricultural runoff and untreated waste water may increase the pollution level and rivers get polluted. Some small scale industries do not have treatment facilities to their effluents because they cannot afford investment in pollution control equipment, therefore in India there are many evidences are observed related with mismanagement of industrial waste. Singare *et al*., (2010).

"Eutrophication" is the excessive enrichment of surface water with nutrients corresponded by high production of Autotrophs, especially algae and cyanobacteria. The undesirable overgrowth of phytoplankton and their subsequent death forms a greenish slime layer over the surface of water body, which restricts the light penetration Khan and Ansari (2008). The death and decay of aquatic plants produce a foul smell and makes the water more turbid Beeton (2002). Runoff from fertilizers used in commercial agriculture or private yards adds large amounts of nitrogen and phosphorus to freshwater ecosystems.

The present study was taken on the Wainganga River at Kardha of Bhandara District. The River water is also used for irrigation purpose in the surrounding agricultural fields and the regular dumping of domestic sewage, the river water has become highly eutrophic. The domestic waste (rich in phosphate and nitrate) when discharged in water bodies makes them highly productive or "eutrophic".

Material and methods:

In the present study an attempt was made to assess degradation of the water of Wainganga River for checking the pollution status. During the present study, water samples were collected two sampling points i.e. Site I and Site II , the samples were collected, in a sampling bottle, to assess their physical and chemical qualities at monthly intervals. The samples were collected in thoroughly cleaned 5 liter inert plastic containers, which were rinsed with distilled water before collection. Water samples then were taken in sampling bottles. The stoppers of the sample containers closed properly to prevent contamination from outside. The containers were labeled the name of the water body, date, time sampling point and conditions under which they were collected as samples. In the present investigation, the water chemistry of Wainganga River has been studied for a period of one year i.e. from January 2017 to Dec 2017 and analyzed important chemical parameters. All the parameters like pH, Temperature, Turbidity, DO, CO_2, BOD, COD, Hardness, Chloride, Phosphates, and Nitrates were analyzed according to the standard methods (APHA 2005 and Trivedi and Goel 1986).

Observation:-

Table: - 1 Showing Seasonal Variations of Physical and Chemical Parameters of Wainganga River at Kardha, District Bhandara

S. No	Parameters	Summer	Winter	Monsoon
1.	**pH**	7.9	7.2	7.1
2.	**Temperature**	36	31	32
3.	**Turbidity (NTU)**	155	135	180
4	**DO (mg/lit.)**	4.2	5.4	5.1
5.	**CO_2 (mg/lit.)**	8.1	7.4	5.8
6.	**BOD (mg/lit.)**	15.1	14.1	12.2
7.	**COD (mg/lit.)**	8.2	7.7	6.5
8.	**Hardness (mg/lit.)**	210	185	178
9.	**Chloride (mg/lit.)**	25	23	18
10.	**Phosphate (mg/lit.)**	23	22	17.2
11.	**Nitrate (mg/lit.)**	23.2	22	17.1

Results and Discussion:

These varying trends reveal that during monsoon season water was turbid; pH fluctuated between 7.1 to 7.9. The minimum pH was recorded in monsoon which was mainly attributed to rain water after a long dry period, and maximum pH was recorded during summer. Yeole and Patil (2005) recorded pH range of 7 to 9.5 of Yedshi Lake, Karanja. The temperature fluctuate between 31^0C to 36^0C as expected, summer months such as March, April and May recorded high temperature and winter with low temperature. Similar results were observed by Pawale R.G. (2014). In the present investigation maximum values of turbidity 180 recorded in Monsoon, where as minimum 135 reported in winter. Basavarrajappa et al., (2009) reported the same. Dissolved Oxygen ranged from 4.2 to 5.4 mg/l it was maximum in winter and minimum in summer, continuous introduction of effluents in water may support the growth of aquatic weeds formed on water surface and due to this reduction of dissolve oxygen takes place, Morrison et al., (2001).

In the present study maximum CO_2 recorded in 8.1 mg/l in summer and minimum in monsoon 5.8 mg/l similar observation done by Kashyap Vinita (2014). Minimum BOD value 12.2 mg/l recorded in monsoon and maximum value 15.1 mg/l recorded in summer. The BOD attended its high peak during summer and low peak in monsoon. Similar observations done by Thorat and Sultana (2001) reported higher values of BOD 140 -180 mg/l indicating organic pollution.COD value ranges from 6.5 to 8.2 mg/l, the COD variations went on changing with seasons and also with release of chemical substances like sewage. The value of hardness ranges between 178 to 210 mg/l. It was maximum in summer 210 mg/l and low during monsoon 178 mg/l Rai and Shrivastava (2006) observed the same. In the present investigation chlorides ranged between 18 to 25 mg/L. The minimum value recorded in the monsoon and the highest value seen in the summer season, similar observation done by Karne and Kulkarni (2009). Phosphate is an important element as it controls the growth of aquatic ecosystem but higher amount of phosphate may cause Eutrophication in aquatic ecosystem in present investigation the minimum phosphate recorded in monsoon 17.2 mg/l. and maximum was 23 mg/l. in summer. Similar observation was done by Gupte and Shaikh (2013). Nitrates is most important plant nutrient, it is found in associated with fertilizers, human and animal waste and sludge discharge , higher concentration of Nitrogen may cause Eutrophication. In present investigation it was minimum in monsoon 17.1 mg/l. and maximum in summer 23.2 mg/l.

Conclusion:

Nitrate and phosphate play a significant role in algal nutrition. Human-induced pollution through the impacts of excessive fertilizer use, untreated wastewater effluents, and detergents significantly increases nutrient loading into water bodies, accelerating Eutrophication. The distribution of algae depends upon, besides many other environment factors, the nutrients and other organic and inorganic substance in the water and the relative adaptability of different species. The water quality parameters have a direct influence upon distribution and ecology of phytoplankton. The densities of phytoplanktons were found to be highest in summers. This coincides with high value of hardness, chlorides, nitrates, phosphate, total dissolved solids, pH and turbidity. The increase in concentration of phosphorus and nitrogen has important effects on the structure of phytoplankton community. The species composition of phytoplanktons exhibit seasonal variations. The members of diatoms were present in maximum number especially during summer month, resulting in bloom formation. During present study, *Eichhornia crassipes* observed abundant during summer and winter months. The high levels of phosphate and nitrated justifies the development of algal blooms at their peak productive stages, especially when light and temperature conditions for their growth.

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