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Effect of various pollutants on primary productivity in river Gomati at Sultanpur (U.P.)

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ABSTRACT

Biological pollutants have direct link with public health. Such pollutants are the etiological agents or vector of water borne diseases including viruses, bacteria, protozoa and helminthes. Bacterial diseases include cholera, typhoid fever, paratyphoid fever and bacillary dysentery. There is wide variation of opinion, regarding the actual definition of heavy metals. There are only few reports of productivity in terms of energy and nutrients of macrophytes species in river ecosystem. Present work gives data on physico-chemical characteristics, productivity, energy and nutrients of phytoplankton in sewage free and sewage influenced nutrient enriched water.

1. Introduction

Water being essential for human physiology as also for all kinds of plants and animals in basic and fundamental necessity and in the same context its cleanliness or purity is significant. Dirty water not only is unsightly and foul smelling but also herbivores abraded microorganisms and vectors responsible for many serious diseases in mankind. Polluted water may also contain toxic and poisonous chemicals.

Polluted water may transmit various types of water borne diseases such as typhoid, Jaundice, cholera, dysentery, paratyphoid fever and many other diseases of epidermis dimensions. Public health authorities are now becoming greatly concerning about various toxic chemical pollutant viz. nitrate, phosphate, chlorinated hydrocarbons, pesticides, herbicides, heavy metals etc. Besides drinking other use which many affect human health are swimming, bathing, agriculture, fisheries etc. Many rivers have flux of sewage, domestic waste, industrial effluents, agriculture wastes etc., which contain highly toxic chemicals such as pesticides, herbicides, heavy metals etc. Fifteen major river viz. Godawary, Ganga, Gomati, Cavery, Narmada, Damodar, Yamuna etc. in our country are facing pollution problem. A number of water borne diseases are caused due to polluted water which result death in a large scale, several liquid effluents are commonly passed out in to rivers directly or indirectly for disposal. A large number of undesirable chemicals are poured in to the river Gomati though wastes, sewage effluents and industrial wastes they not only change the pH of water drastically but also proved toxic to plant and animal life.

There are following types of water pollutants added by domestic, agricultural sewage in the river Gomati viz.

- Oxygen demanding wastes including domestic sewage, industrial discharges and biodegradable organic compounds.
- Disease causing agents like bacteria, viruses.
- Synthetic organic compounds like pesticides herbicides, synthetic detergents.
- Plants nutrients like nitrogen and phosphorus.
- Heavy metals also added in sewage by different sources.

Biological pollutants have direct link with public health. Such pollutants are the etiological agents or vector of water borne diseases including viruses, bacteria, protozoa and helminthes, bacterial diseases include cholera, typhoid fever, paratyphoid fever and bacillary dysentery.

A basic factor which focuses the concern over the presence of potentially toxic heavy metal in the environment is their non-bio deg readability and consequent persistence. This is further magnified by the tendency of some metal not ably Hg and Cd to become more concentrated in food chains through bio-accumulation. Thereare only few reports of productivity in terms of energy and nutrients of macrophysics species in river ecosystem. Present work gives data on physic-chemical characteristics, productivity, energy and nutrients of phytoplankton in sewage free and sewage influenced nutrient enriched water. Two sites were selected

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to compare the above parameters of phytoplankton in river Gomati at Sultanpur. There was a good growth of phytoplankton's at both the sites. There was a very little growth of emergent plants. At sewage discharge and up to about 1 km downstream there was no grown of phytoplankton.

Study Site

Sultanpur is a city and a municipal board in Sultanpur District in the Indian state of Uttar Pradesh. Located on the right banks of the Gomati, Sultanpur is the administrative headquarters of Sultanpur District and is a part of Faizabad Division. It is situated 135 kilometers east of state capital Lucknow.

Sultanpur is the headquarters of the Sultanpur district, north side of this district is bounded by Faizabad district, south side is bounded by Pratapgarh district, west side is bounded by Barabanki district and Raebareli district and the east side is bounded by Azamgarh district, Ambedkarnagar district, and Jaunpur district. It has an average elevation of 95 meters (312 ft). Geography of Sultanpur comprises plain lands except some regions around Gomati river which drains almost the whole city and district, however southern part of city drains towards Sai river flowing through the Pratapgarh district. The only significant mineral found in region is Kanker.

Fig. 1. Study site

Primary production and energetic

The concept of energetics in ecological system had been established by Lindeman. Energy flow through primary producers in aquatic ecosystem has been studied by Rai and Hill. In General, macrophytes are more productive than phytoplankton per unit area and Straskraba. The show luxuriant growth in water bodies with shallow basin and belong to the most productive biotopes on earth. The major thrust on the primary productivity studies was laid during the International Biological Programme (IBP). Most of the primary productivity studies carried out before and during the IBP were limited to specific biomes. A review of the primary productivity research was made by Lieth. In Amazonian aquatic ecosystem Rai and Hill studied the primary production. The global productivity patterns were established by Bunt. Likens and Lieth. In India, the primary production studies of ponds and lakes has been made by Ambasht, Kaul et al. Sinha and Sahai, Verma and Singh.

Lindeman initiated the concept of ecological energetics in aquatic systems through his classical work on Cedar Bog lake in U.S.A. Park has emphasized the importance of understanding of community structure and function from the view point of its metabolism and energy relationships. Odum has worked out the energy relationship in aquatic ecosystems of Silver springs, Florida, Golley studied caloric values, and energy storage and energy flow in old-field community and Broom sedge community of Georgia, U.S.A. This chapter deals with primary production of phytoplankton at Sultanpur River situated at upstream in the Middle of Sultanpur and is relatively free of pollution load and River is the end of city on the downstream, disturbed by human activities and effluent discharge of the city. On both the sites there was good growth of phytoplankton but at the point of sewer discharge and up-to one kilometer downstream, there was very little growth of aquatic macrophytes. The specific objectives of the study were to measure: (a) monthly biomass of phytoplankton species, (b) estimation of seasonal productivity distributed in three zones on biomass and energy basis, and (c) two factor analyses of variance and energy content between months and site.

2. Materials and methods

Standing crop biomass was measured by harvest method. Samples were collected in 50 x 50 cm square quadrats for biomass and energy estimation of emergent and free-floating zone. For submerged zone, a vertical core sampler 25 x 25 cm was used. Plant material was collected in polythene bags and brought to the laboratory. Plant samples were washed thoroughly in tap water to remove mud, silt and clay particles completely. Different species were separated, oven drieciat 80°C for 78 h, weighed. The plant samples of each species after dry weight estimation were powdered and pressed into of about 19 for energy estimation. A combustion wire of 10 cm length was inserted in each sample. The calorific value of each sample was estimated by the Parr. Oxygen bomb calorimeter, Preweigheted pellets were placed in ignition cup of the bomb using nickel—chromium fuse wire. The bomb was filled with oxygen at about 12 to 15 atmospheric pressure and immersed in the steel bucket filled with 1300 ml of water. After closing the system, the pellets were burnt in the bomb and change in temperature was noted. Both in the biomass sampling and the energy estimation three replicates were taken. Necessary correction for the heat generated due to burning of fuse wire was made according to the Parr Instrument Co. Manual No. 130 of 1968.

Energy concentration thus obtained of calories per gram of dry emitter is converted into energy content by multiplying with the monthly biomass values of each species. The values are then converted into kJ. From the positive difference of monthly dry wt. biomass and energy content values, the annual productivity was computed.

The factor analysis of variance between site and month was done to see the significance of variation of biomass and energy content. The site and month interaction was also calculated. When the interaction was significant, the variation of biomass and energy content between sites was tested by calculating LSD.

3. Results and discussion

The emergent zone of Sultanpur River was constituated by Spirogyra and Cladophora, and there was no phytoplankton vegetation at River in this zone. Peak standing crop biomass values of 279.88 g M^{-2} for Spirogyra and 49.96 g M^{-2} for Cladophora were recorded and the corresponding minimum values were 16.72 g M^{-2} and 4.75 g m^{-2}, respectively.

The average standing crop biomass of the emergent zone was 173.84 g M^{-2} of which Spirogyra contributed as much as 150.49 gm-2 and Cladophora 23.35 g m^{-2}. Maximum biomass in the

emergent zone observed in summer season followed by rainy and winter. ANOVA of biomass varied significantly between months.

Table 1. Anova for biomass of phytoplanktons of river Gomati between site and month

	Value		
	Site	**Month**	**Site × Month Interaction**
Oedogonium sp.	180.82***	70.95***	15.31***
Ulotrhix sp.	153.19***	29.68***	0.77^{NS}
Spriogyra sp.		6.38***	
Cladophora sp.		5.45***	
Zgnema sp.	18.93***	15.24***	0.92^{NS}
Diatoms sp.	129.12***	105.45***	3.24^{NS}
Nostoc linkia	188.28***	147.95***	16.78***
Anacystis nidulans	158.77***	247.90***	6.38***

Significant at: P < 0.01;** P < 0.25,*** - P < 0.005; NS = Not Significant

4. Conclusion

The emergent zone of Sultanpur River was constituated by Spirogyra and Cladophora, and there was no phytoplankton vegetation at River in this zone.

References and notes

1. A. A. Adebisi, *Hydrobioologia*, **1980**, 79, 157-165.
2. M. Agami and Y. Waisel, *Physiol. Veg.*, **1986**, 24, 607-624.
3. D. K. Agrawal, Physcio-chemical and bactgeriological analysis for Ganga water at Varanasi. M.D. Thesis, **1973**.
4. S. K. Agrawal, Water Quality of Sewage drains entering in to Chambal at Kota Acta Ecol., **1983**, 5, 2.
5. V. Kaul, *Hydrobiologia*, **1971**, 12, 63-69.
6. V. Kaul, *Int. J. Eco. Environ. Sci.*, **1977**, 3, 29-44.
7. B. Prasad, *J. Asiat. Soc. Beng.*, **1916**, 12, 142-145.
8. H. Rai, *Hydrobiologia*, **1975**, 44 (2-3), 301-317.