Biospectra : ISSN: 0973-7057, Vol. 14(2), September, 2019, pp. 93-96

An International Biannual Refereed Journal of Life Sciences

Animal Science

ISSN : 0973-7057

Int. Database Index: 663 www.mjl.clarivate.com

Studies on the energy flow and physico-chemical parameters in some ponds of Madhepura, Bihar

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Received :17th July, 2019 ; Revised : 29th August, 2019

Abstract- Energy flow is vital for the establishment of any living form on this planet. The energy flow is always unidirectional, usually following the 10% low. The 10 % low states that only 10% of the energy is that is available in any trophic level is transferred to the next trophic level. The energy flow is usually continuous and requires the involvement of almost all biotic & abiotic components. Earth is massive so the energy flow is complex as well as unique for every ecosystem. The ponds form a small part in this interacting ecosystem, representing more or less ideal example. In the present study the ponds studied were observed for all aspects, such as the flora, fauna, water acidity & alkalinity and the presence of inorganic and organic matter usually their percentage. The affects of these components on the energy flow was studied. The most focused aspect of this study was the change in the biological oxygen demand & chemical oxygen demand and their effect on energy flow.

Keywords-physico-chemical studies, biotic components energy flow

INTRODUCTION

The biotic components of the pond ecosystem include phytoplanktons, zooplanktlons, fishes, aquatic plants algae, fungi, bacteria & other decomposers that help in nutrient cycle. The producers are the aquatic green plants which may be divided into two groups; microphytes (microscopic autotrophs) which fix solar energy such as spirozoa, zygnema, volvox etc. & macrophytes which manufactures complex food such as pistea, hydrilla etc. Ecosystem O_2 uptake, ecosystem respiration, and ecosystem metabolism became synonymous with ecosystem energy flow, now regarded as an ecosystem function.[1] Biotic factors are materials produced by living organisms that affect the ecosystem. That is why the energy flow from a producer to a consumer is essential for balance within the ecosystem. Organisms can be either producers or consumers in terms of the flow of energy through an ecosystem. Energy flow in aquatic ecosystems is a consequence of metabolic activity of all organisms producing heat in accordance with the second law of thermodynamics.[2] Community primary production and the respiration of many species as well as of entire biotic communities are still being measured at present in terms of oxygen production and uptake.[3] In this paper energy flow in an aquatic ecosystem of all forms of matter in plankton and intertidal sediment samples, ecosystem

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respiration and energy flow are greatly underestimated by measurements of oxygen uptake.

The energy is required for the performance of all kind of life activities. The existence of living world depends upon the flow of energy and circulation of materials through the ecosystem. The ultimate source of this energy is sun. Nearly 8 per cent of solar energy which enters the earth surface strikes the plants, out of which 80-85 per cent is absorbed, and only fifty per-cent of it is utilized in photosynthesis.[4] The energy is then stored in plants and represent first trophic level in the ecosystem. The energy is passed to the next trophic level through the consumers. A food chain in any ecosystem usually consists of maximum four steps, the producers, primary consumers, secondary consumers and tertiary consumers. The energy flows from the producers to consumers and at every level 80-90 % of the stored energy is dissolute as heat produced during the process of respiration.[5]

Ecologists have long debated what regulates the trophic structure and dynamics of ecosystems. [6] This is important because trophic structure and dynamics regulate many of the goods and services that ecosystems provide to wildlife and humankind, such as the production of harvestable food and energy, carbon sequestration and modulation of climate change, and nutrient uptake and control of global biogeochemical cycles.[7,8]

MATERIALS & METHODS

To study the biotic norms of prey-predator relationship in a pond ecosystem several ponds have been visited. Ponds are situated in Murliganj and Parwa Bishanpur area. An area of approximately 3 acres is occupied by these ponds. The various physical, chemical and biological parameters were studies. Physical factors studied were temperature which on average ranged between 22-31 ^{o}C. RH% average ranged about 93%, average rainfall about 169.95mm .The transparency was measured and was found out to be good. The ponds were less turbid. Rainfall is highest during the months of July – August about 290mm-396mm. Chemical factors was also measured such as pH, alkalinity, acidity, hardness, carbonates, phosphates, nitrates, sulphates etc. In biological parameters zooplanktons, phytoplanktons nektons were found to in plenty, benthic organism usually found in the bed of the ponds. The ponds were rich in benthic organism such as aquatic insects, snails, aufwuchs (mixture of algae, fungi & bacteria)

Table 1- Physico-chemical parameters of Murliganj and Parwa Bishanpur area during the investigation

Sl.No.	Year	Month	Temperature(^{o}C)		RH(%)	Rainfall (mm)
			Min.	Max.		
1.	2017	July	24.5	32.1	95	358.3
2.		August	23.4	30.1	92	266.3
3.		September	22.9	29.8	96	233.2
4.		October	23.1	29.9	95	256.2
5.		November	22.3	31.5	93	244.2
6.		December	20.2	29.3	95	123.2
7.	2018	January	20.3	30.2	94	5.4
8.		February	21.2	31.0	92	2.3
9.		March	23.5	34.1	91	40.2
10.		April	24.2	34.2	92	102.3
11.		May	23.3	33.2	93	152.3
12.		June	23.5	31.8	95	255.5

CONCLUSION

On conducting the above study it is found that all the ponds were rich in biotic components. The food webs were highly complex and involvement of varieties of organism was there. It was seen that even by removing one aspect of the pond, the dynamic stability of the ecosystem was disrupted. These ponds formed an ideal example of how our whole ecosystem works. Even a

microscopic zooplankton holds as much importance as a large fish.

To keep these ponds pollution free, a lot of effort has to be taken. Though self cleaning, human involvement and inappropriate garbage disposal effects the entire organism and simultaneously the food chain and webs. In all, various factors contribute equally in maintaining this dynamic equilibrium between prey and predator. Increase in either of the two can cause a misbalance, adversely affecting all the biotic components.

ACKNOWLEDGEMENT

The authors are thankful to the Head of Department of Zoology, B.N.M.University, Madhepura for providing the necessary guidance and equipment.

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