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Primary productivity of Darmasagar lake in Adilabad, Andhra Pradesh, India

Chinnaiah B.* and Madhu V.
Algal Bio-Technology & Hydro Biology
Department of Botany Kakatiya University, Warangal, (506 009), A.P.-India

Abstract

The present study deals with the primary productivity of Darmasagar lake Adilabad. The investigation was done from October 2009 to September 2010. The result of the study indicated high levels of primary productivity, especially in September 2010 during the postmansoon period. The NPP/GPP ratio and respiration in terms of percentage of gross production was also computed. The productivity pattern in Darmasagar Lake is bimodal with ups in May and September. The magnitude and higher values of primary productivity suggest that Darmasagar Lake in entropic in nature.

Keywords: Darmasagar Lake, Productivity, Adilabad.

Introduction

The Darmasagar lake of Adilabad (Dist.) A.P. is the important tourist places, with beautiful temples built by mighty Nimmanaidu kings, during the period of 8th century. The estimation of primary productivity of an ecosystem is essential to understand its food chains and food web. The daily and seasonal carbon flow in the system forms the base of annual food pyramid and can be used to estimate production of at higher tropic levels. Lakes are one of the important sources of potential production in the world. Physical, chemical, and biological aspects influence primary productivity directly and the fish production indirectly. Darmasagar lake is situated in dense rural area of Adilabad District at a latitude of 17°18' and 18.°.35'North and Latitudes of 78°18' and 80°62' East. The area around the city is studied with scattered hills. Gross catchment area of Lake is about 1200 acre. Its water is used for washing of cloths, bathing of animals, discharge of domestic and hospitals wastes and for irrigation in fields. All these increasing anthropogenetic activities in and around aquatic systems and their catchment areas have largely contributed to deterioration of water quality leading to their accelerated eutrophication. Eutrophication is a potent threat to the biodiversity of aquatic environment[1], environ ecological status of freshwater lakes[2] and physico-chemical parameters in fresh water bodies[3]. The purpose to perform the present study is to assess the primary productivity and to understand the phenomenon of eutrophication to discover better possibilities of pisciculture in the lake. The ever increasing importance of this lake makes the present study extremely relevant.

Material and methods

During the present investigation monthly variation in primary productivity was studied at surface of the lake at four sites between October 2009 and September 2010. The primary productivity was estimated by "light and dark bottle method as described[4].

*** Corresponding Author**
E-mail: dr.chinnaia@rediffmail.com

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Results and Conclusion

The primary productivity in the present study has been dealt with under two headings viz. gross primary productivity (GPP) and net primary productivity (NPP), community respiration, NPP/GPP ratio and respiration percentage of GPP were also computed. Due to gross similarities in primary productivity of the sites the average values have been taken in to consideration for interpretation. Monthly variations in primary productivity of Darmasagar lake is shown in Table 1. The values of GPP varied from 3.53 g. $cm^{-3}d^{-1}$ to 8.39 g.cm $^{-3}d^{-1}$ .The values of NPP ranged between 1.02 $g.cm^{-3}d^{-1}$ and 5.06 $g.cm^{-3}d^{-1}$. The highest values were observed in September.

Table 1: Mean monthly variations in primary productivity of Darmasagar lake expressed in $g.cm^{-3}d^{-1}$

Months	NPP	GPP	CR	NPP/GPP	Respiration (% of GPP)
Oct.2009	1.02	6.66	5.64	0.153	84.684
Nov.2009	3.82	5.50	1.68	0.694	30.546
Dec.2009	1.26	4.49	2.23	0.280	71.987
Jan.2010.	2.73	4.63	1.90	0.589	41.036
Feb.2010.	2.33	3.53	1.20	0.660	33.994
Mar.2010.	2.15	5.23	3.08	0.411	58.891
April 2010	1.55	4.09	2.54	0.378	62.107
May.2010.	2.86	6.36	3.40	0.449	53.459
June.2010.	2.20	5.93	3.73	0.370	62.900
July.2010.	3.83	6.09	2.26	0.628	37.110
Aug.2010.	1.73	4.99	3.26	0.346	65.330
Sep.2010.	5.06	8.39	3.33	0.603	39.690

Abbr.: NPP - Net Primary productivity, GPP - Gross Primary Productivity, CR - Community Respiration

The values of community respiration (CR) ranged from 1.2$g.cm^{-3}d^{-1}$to 5.6$g.cm^{-3}d^{-1}$ the highest value was observed in October, NPP/GPP ratio varied between 0.153 and 0.694. The highest value of NPP/GPP ratio was observed in November. The values of respiration % of GPP varied from 33.994 to 84.684. The highest value was observed in October. In present study primary productivity showed high values in premonsoon or winter season. The lowest values of primary production were observed during monsoon. These results are in accordance with Mwanchiro [5]. Naz[6] reported maximum primary productivity in winter and minimum in summer, Mandal[7] stated that the trend of fluctuation shows that values of GPP and NPP increased gradually during winter and summer months and decreased during monsoon months. The highest rate of productivity during summer may be due to bright sunshine with high temperature, high phytoplankton density and algal blooms. The winter lows could be attributed to the reduced photoperiod coupled with low light intensity, temperature and scare phytoplankton. The lowest values of primary production in monsoon could be related to dilation effect and over cast skgo which are known to reduce the photosynthetic activity. Phytoplankton abundance is followed by zooplankton peak[8]. Less abundance of phytoplankton during monsoon might be due to turbidity and grazing pressure exerted by zooplankton[9]. The primary productivity of Darmasagar lake shows a dimodal pattern of fluctuation with ups in May and September. This confirms the finding[10]. The bimodal pattern in the fluctuation of productivity values in the present work has been invariably reported in case of many entropies bodies. The community respiration exhibited a significant annual variation in Darmasagar lake and that too is in bimodal pattern in conformity[11]. So, this investigation reveals that Darmasagar, lake is an entropic lake. This indicates better possibilities of pisciculture in this lake and the Darmasagar lake also need better management and restoration. Today many lake managers have adopted the option of increasing macrophyte abundance in order to restore entropic waters[12]; the duck weeds have strong potential as indicators of water quality and eutrophication[13].

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