

SEASONAL VARIATION OF PRIMARY PRODUCTIVITY OF BENISAGAR DAM IN CHHATARPUR DISTRICT (M.P.), INDIA

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Abstract: The present study deals with the primary productivity of Benisagar Dam in Chhatarpur District (M.P.). The investigation was done from June 2012 to May 2013. Benisagar dam is situated with Longitudes and Latitudes of 24°6' and 25°20' on North 78°59' to 80°26' on East respectively with approximate 182 meter above mean sea level experiencing an annual rain fall of 975-1150 m.m. Average temperature in cold 6-9 °C, summer 45-47° C, and rain 28-37°C. Banisagar dam is the most important dam of Chhatarpur district; besides being a source of water for irrigation and also the water of this dam used for artificial breeding of Major Carp in the Chinese Hatchery is located here and area of the dam 380 hectare. The result of the study indicated high levels of primary productivity, especially in September 2010 during the post monsoon period. The NPP/GPP ratio and respiration in terms of percentage of gross production was also computed. The productivity pattern in Benisagar dam is bimodal with ups in May and September. The magnitude and higher values of primary productivity suggest that Benisagar Dam in entropic in nature.

Keywords: Benisagar Dam, Primary Productivity.

I. INTRODUCTION:

Primary productivity is the rate at which the sun's radiant energy is stored by photosynthetic and chemosynthetic activities of producers (phytoplankton, algae and macrophytes in water) in the form of organic substances (Odum, 1971). Biological production in any aquatic body gives direct correlation with its physico-chemical status which can be used as trophic status and fisheries resource potential. Primary production studies are of paramount interest in understanding the effect of pollution on system's efficiency. High rates of production both in natural and cultural ecosystems occur when physicochemical factors are favorable (Sultan *et al.*, 2003).

Banisagar dam is the most important dam of Chhatarpur district; besides being a source of water for irrigation and also the water of this dam used for artificial breeding of Major Carp in the Chinese Hatchery is located here and area of the dam 380 hectare. 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. Dams and 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. Benisagar dam is situated with Longitudes and Latitudes of 24°6' and 25°20' on North 78°59' to 80°26' on East respectively with approximate 182 meter above mean sea level experiencing an annual rain fall of 975-1150 m.m. Average temperature in cold 6-9 °C, summer 45-47° C, and rain 28-37°C. 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 anthropogenic 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; environ ecological status of freshwater dams and physico-chemical parameters in fresh water bodies. 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 dam. The ever increasing importance of this lake makes the present study extremely relevant.

II. 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 Mandal (1992).

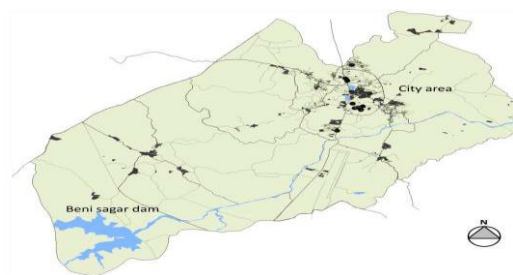


Fig. No. 1 Map of Benisagar Dam, Chhatarpur Distt.(M.P.)

III. RESULTS AND CONCLUSION:

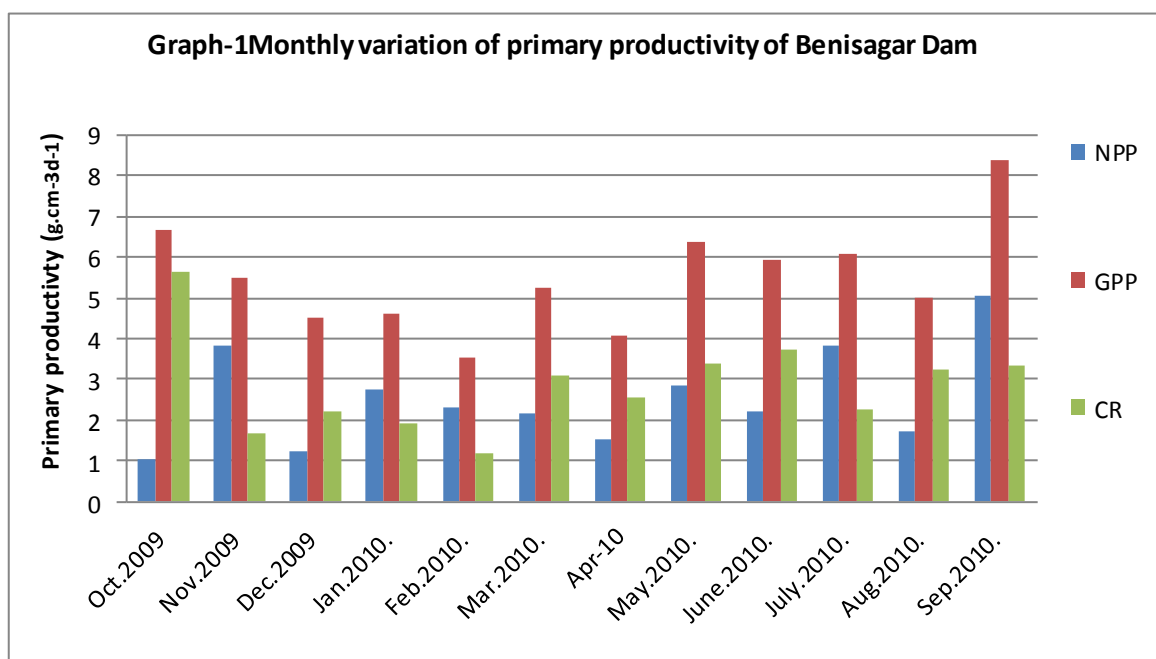
The primary productivity in the present study has been dealt with under two headings viz. gross primary productivity (GPP) and net primary productivity (NPP), community respiration, NPP/GPP ratio and respiration percentage of GPP were also computed. Due to gross similarities in primary productivity of the sites the

average values have been taken in to consideration for interpretation. Monthly variations in primary productivity of Benisagar dam is shown in Table 1. The values of GPP varied from 3.53 g.cm-3d-1 to 8.39 g.cm-3d-1 .The values of NPP ranged between 1.02 g.cm-3d-1 and 5.06 g.cm-3d-1. The highest values were observed in September.

Table 1: Mean monthly variations in primary productivity of Benisagar Dam expressed in g.cm-3d-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 1.2g.cm-3d-1 to 5.6g.cm-3d-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 (1998). Naz (2006) reported maximum primary productivity in winter and minimum in summer, Mandal (1992) 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 scarce phytoplankton. The lowest values of primary production in monsoon could be related to dilution effect and over cast sago which are known to reduce the photosynthetic activity. Phytoplankton abundance is followed by zooplankton peak (Mazhar; 1992). Less abundance of phytoplankton during monsoon might be due to turbidity and grazing pressure exerted by zooplankton (Rao et.al. 1999). The primary productivity of Benisagar Dam shows a dimodal pattern of fluctuation with ups in May and September. This confirms the finding (Prasad et.al. 2003). 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 Benisagar Dam and that too is in bimodal pattern in conformity (Kund ; 1992). So, this investigation reveals that Benisagar dam is an entropic lake. This indicates better possibilities of pisciculture in this lake and the Benisagar Dam also need better management and restoration. Today many lake managers have adopted the option of increasing macrophyte abundance in order to restore entropic waters Lane (2002); the duck weeds have strong potential as indicators of water quality and eutrophication (Ansari et. al. 2004).

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