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ASSESSMENT OF PRIMARY PRODUCTIVITY OF BANKI DAM IN AMBIKAPUR SURGUJA (C.G.)

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ABSTRACT

All life on earth depends on water. Fresh water is a critical, finite, vulnerable, renewable natural resource on the earth and plays as important role in our living environment without it life is impossible. The present study deals with the primary productivity of Banki Dam Amibikapur, Surguja district (C.G.). The investigation was done from January 2024 to December 2024. Primary productivity gives information related to the amount of energy available to support bioactivities of the system. The result of the study indicated high levels of primary productivity, especially in September 2024 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 Banki dam is bimodal with ups in May and September. The magnitude and higher values of primary productivity suggest that Banki dam in entropic in nature.

KEYWORDS : *Banki dam, Primary Productivity, Ambikapur.*

INTRODUCTON

The nature have given different sorts of natural assets to human and other living organism as in type of soil, water, minerals and gasses and so on. Among these, the water is most valuable imperative and sustainable natural asset, and further more gives a profitable back ground to human progress. Water is the most basic imperatives which give to maintain the life on earth, and it is a universal solvent having too many disintegrated chemicals in itself. By using these substances for their different metabolic exercises, aquatic plants and animals realize changes in synthetic composition of water. Information of this changed condition is in this way imperative in comprehension to perplexing relationship between the biotic and abiotic parts.

Water is our most bounteous resource, covering around 71% of the earth's surface. About 97% of water is in the ocean as salt water and the remainder constitutes freshwater and hardly 1% is in the rivers, lakes and underground. Basic to life, water constitutes 50 to 97% of the body weight of living organism like plant and animals. Water is additionally fundamental to agriculture, manufacturing, transportation and endless other human activities.

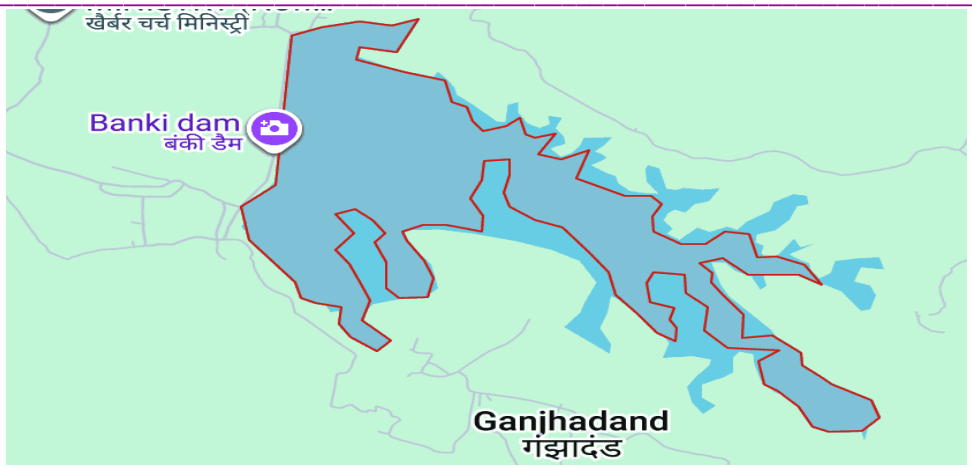
The flow of energy through any ecosystem starts with the fixation of sunlight by plants and other autotrophic organisms. In this way the plants accumulate which is called primary production. The rate at which this energy accumulates is called primary productivity. The total energy accumulated is gross primary production; however, since plants use some of this energy themselves, it is not available for the food web (Gupta et.al.; 1989). Estimation of primary productivity is essential to understand food chain and food web (Chinnaiah et.al; 2010), water quality (Raj Kumar; 2005) and pollution study (Mitesh et.al.; 1993). The primary productivity of the aquatic ecosystem is adversely affected by anthropogenic activity. The overall productivity of a water body can easily be deduced from its primary productivity, which forms the backbone of the aquatic food chain Ahmed S.H et. al (1989). It gives information related to support bioactivities of the system. According to Odum E.P. and Barrett (2008) the primary productivity of an ecosystem is the rate at which radiant energy is converted to organic substances by the photosynthetic and chemosynthetic activity of the producer organisms. The aquatic resources have been till date the potential source of organic production for the entire living organisms. Many ecologists of the world have laid emphasis on the importance of the primary productivity as an important functional attribute of the biosphere because of its controlling effects on the rate of multiplication and growth of the living organisms of the ecosystem (Prabhakar et.al; 2009) .

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.

The present study is focused on analyzing the water quality of Banki Dam, located in the Khairbar region of Ambikapur, in Surguja district, Chhattisgarh, India. This dam is a significant source of water for the surrounding rural areas, supporting both domestic and agricultural needs. Therefore, regular assessment of water quality is crucial to prevent health hazards and maintain ecological balance. 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 (Ansari et.al; 2004), environ ecological status of freshwater lakes (Latha et.al.; 2010) and physico-chemical parameters in fresh water bodies (Dhembare A.J. 2007). 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 dam at four sites between January 2024 to December 2024. The primary productivity was estimated by “light and dark bottle method as described (Gaarder et.al.; 1927).



Map of Banki Dam Ambikapur Surguja (C.G) (Source of Google Map)

RESULTS & DISCUSSION:-

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 Banki 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.

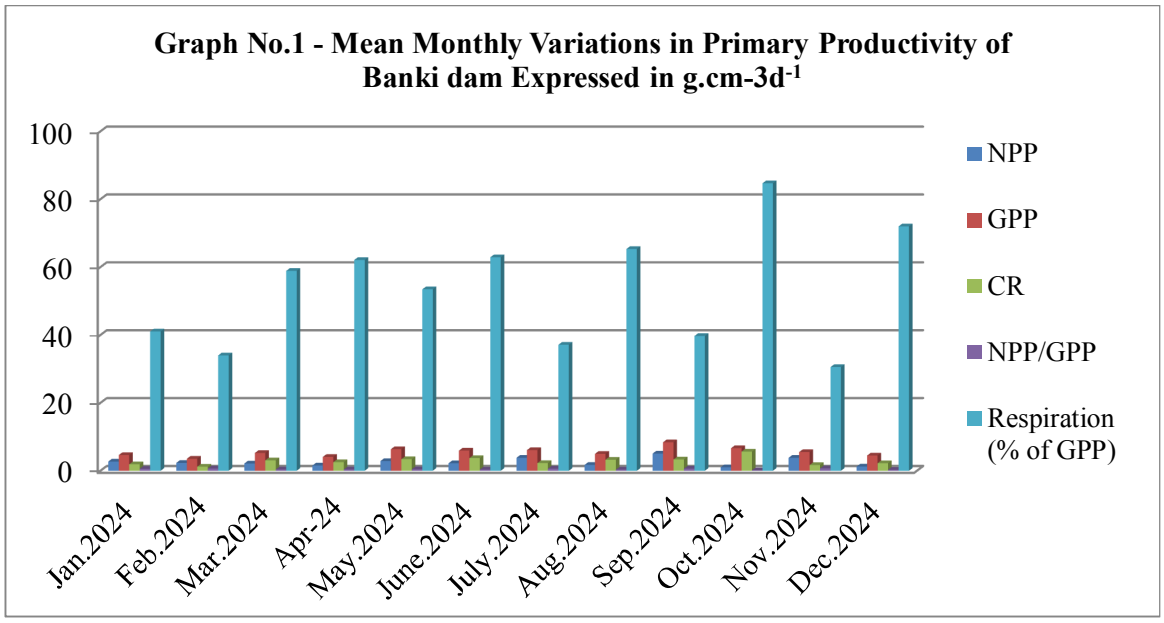


Table 1: Mean monthly variations in primary productivity of Banki dam expressed in g.cm-3d-1

Months	NPP	GPP	CR	NPP/GPP	Respiration (% of GPP)
Jan.2024	2.73	4.63	1.9	0.589	41.036
Feb.2024	2.33	3.53	1.2	0.66	33.994
Mar.2024	2.15	5.23	3.08	0.411	58.891
Apr-24	1.55	4.09	2.54	0.378	62.107
May.2024	2.86	6.36	3.4	0.449	53.459
June.2024	2.2	5.93	3.73	0.37	62.9
July.2024	3.83	6.09	2.26	0.628	37.11
Aug.2024	1.73	4.99	3.26	0.346	65.33
Sep.2024	5.06	8.39	3.33	0.603	39.69
Oct.2024	1.02	6.66	5.64	0.153	84.684
Nov.2024	3.82	5.5	1.68	0.694	30.546
Dec.2024	1.26	4.49	2.23	0.28	71.987

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

The values of community respiration (CR) ranged from 1.2g.cm-3d-1to 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 pre-monsoon or winter season. The lowest values of primary production were observed during monsoon. These results are in accordance with (Mwanchiro et.al.; 1998). Naz et.al. (2006) reported maximum primary productivity in winter and minimum in summer, Mandal et.al. (1999) 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 sago which are known to reduce the photosynthetic activity. Phytoplankton abundance is followed by zooplankton peak (Mazhar et.al.; 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 Banki dam shows a bimodal pattern of fluctuation with ups in May and September. This confirms the finding (Prasad B. 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 Banki dam and that too is in bimodal pattern in conformity (Kund K. 1992). So, this investigation reveals that Banki dam is an entropic water body. This indicates better possibilities of pisciculture in this dam and the Banki dam also need better management and restoration. Today many dam managers have adopted the option of increasing macrophyte abundance in order to restore entropic waters (Lau S. et.al; 2002); the duck weeds have strong potential as indicators of water quality and eutrophication (Ansari; 2004).

CONCLUSION:-

It is observed from above results that most of the seasonal values of primary productivity of Banki dam, Ambikapur (C.G.). Hence it is concluded that the productivity of Banki dam is moderately

productive. This productivity of Banki dam showed their food chain and food web is in good condition and it favors better growth of zooplanktons and fishes. It also indicates the water body is polluted and leads towards eutrophication. Moderate productivity of Banki dam may be due to shallowness of area which is more productive than deep water bodies in part due to nutrients regulating from sediments and extent of attached macrophyte growth.

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