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Seasonal Fluctuation of Primary Production in Bonal Reservoir, Gulbarga District, Karnataka. India

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Abstract

This paper deals with Biannual variability of primary productivity depends upon the seasonal cycles from October 1999 to September 2001 has been observed. The Gross primary productivity is increased in summer seasons followed by north east monsoon seasons due to variation of environmental factors like high temperature, low alkalinity, low hydrogen ion concentration and excessive growth of aquatic vegetation in reservoir. The productivity and hydrogen ion concentration to synthetic efficiency were higher in summer and winter seasons as in compare to rainy season. The statistical analysis of primary production in relation to important environmental factors indicates the effect of hydrogen ion concentration, dissolved oxygen, total alkalinity, chloride, total hardness, total dissolved solids, turbidity, calcium and magnesium.

Keywords: Reservoir, primary production, environmental factors, seasonal cycle.

INTRODUCTION

The present study has been made to analyze physico chemical parameters of Bonal reservoir. Now a day pollution is the biggest problem in this earth especially water pollution as a result human activities, so that water is not suitable for drinking as well as domestic use. Primary productivity is the most important biological hydrogen ion concentration phenomenon in nature. Which involves the trapping of radiant energy of the sun and its transformation in to high potential biochemical energy by the process of hydrogen ion concentration and photosynthesis. The production of organic matter in aquatic environment has held the attention of the hydro biologists since long. The synthesis of basic food i.e. its transformation of inorganic substances into organic form is similar to that of terrestrial environment.The Primary productivity relates to the amount of organic matter synthesized in a certain space per unit time. Some of the studies on Primary productivity of Indian fresh water include those of Sreenivasan (1963, 1964a,1964b and 1072) from different tanks of Tamil Nadu. According to Reymont, productivity in broad sense is a concept of organic matters synthesis potential which measures ability of an area to support a biological population and sustain level of growth and respiration. Nasar and Nasar (1976) Gopal et al., (1978) have added to Primary production studies of different types of reservoir from Himachal Pradesh. Khan and Zutshi (1980) gave an account on Primary productivity and hydrogen ion concentration status of a Khashmir lake. Singh and Desai (1980) observed Primary productivity of Rihand reservoir. Ayyappan and Gupta (1985) have opined that the production in Ramasamudra tank from coastal Karnataka was controlled by several hydrogen ion concentration factors. Sinha et al ., (1990) reported on the seasonal study of primary productivity of hydrogen ion concentration phytoplankton communities in three different types of fresh water bodies from Bihar state. Vijaykumar and Paul (1991) reported on the Primary productivity of different water bodies in Dharwad, Karnataka state. Vijaykumar et al., (2000) studied on seasonal variation in the Primary productivity of Gobbur tank, Gulbarga. Jindal and Kaur (2000) and Shukla and Pawar (2001) investigated on heavy metal toxicity on the production of freshwater ecosystem at Khuda village, Chandigarh and Govingarh lake, Rewa Madhya Pradesh and observed minimum rate of Primary production during monsoon season. The objective of the present study is to understand the seasonal fluctuations in the gross and net Primary productivity rate with respect to variation of environmental factors in the reservoir.

MATERIALS AND METHODS

The study area Bonal reservoir is shallow water bodies in northern part of Gulbarga District, Karnataka state , falls under 77^0 - 45 ‘ E longitude and 16^0 – 33’ N latitude. Which has natural hillocks that form a natural wall. The total catchment area of the reservoir is 40.96 sq.miles and maximum depth 12 ft and minimum 4ft. The samples preserve in refrigerator at 4^0C which is most general accepted method .The water temperature and atmospheric temperature were recorded by digital centigrade thermo meter in field. This is

perennial nature and water level start rising in premonsoon period and the level drop in summer seasons. The investigation is carried out for a period of 24 months from October 1999 to September 2001. The sampling was done in first week of every month at seven stations were selected to study the variations in these stations. Primary production involving the chemo auto hydrogen ion concentration processes, from the base of energy flow in the ecosystems. An understanding of Primary production become more essential in the evaluation of the capacity of any ecosystem including that of standing water bodies. Thus, this aspect has drawn the attention of numerous limnologists. Primary production" in situ " was estimated by Gaarder and Gram (1972) " Light and Dork Bottle Method". A set of one light and dark bottle along with one more bottle (for collection of sample for determining initial dissolved oxygen) was suspended using floats at each station so as to maintain the bottles 10 cm below the water surface. These bottles were filled with surface water and closed tightly and then the dark bottle (printed with black emulsion paint) was covered with a black cotton bag of the size of the bottle. The primary productivity study was always carried out after 1000 hours. The time of exposure (incubation period) in the present studies was for a period of 4 hours. The initial dissolved oxygen was determined using the sample from the third bottle. Hydrogen ion concentration photosynthesis quotient of 0.375 was used to convert oxygen values. After the completion of incubation period, dissolved oxygen fixed by manganous sulphate Hydrogen ion concentration and alkali iodide at the site of the study and transferred to the laboratory for further estimations using Winkler's method (Hydrogen ion concentration 1998). The rate of gross and net Primary production and consumption of oxygen organic matter during respiration of plankton were arrived by using the oxygen values. The available evidences from the previous works reveal that the productivity profile varies from one region to other Gopal et al., (1978), Khatri (1984), Vijaykumar (1991 and 1994) which is influenced by environmental factors and they also opined that the conditions which are generally mentioned to influence the production are the amount of available light, temperature and nutrient levels.

RESULTS AND DISCUSSION

The seasonal fluctuation of gross Primary productivity at different seasons during from October 1999 to September 2001 (Table -1 &2 and Fig 1 &2).The minimum value of gross Primary productivityfrom 0.270 gC/m3/hr to 0.282 gC/m3/hr recorder during south west monsoon season and maximum 0.696 gC/m3/hr. to 0.797gC/m3/hr. were noticed in summer seasons. Were as the peak in net Primary productivity ranged between from 0.406 gC/m3/hr to 1.243 gC/m3/hr and community respiration varied between 0.124 gC/m3/hr. to 0.473 gC/m3/hr. In present investigation the Bonal reservoir more or less similar trend of fluctuate at same seasons of both the years.

Table 1: Monthly average values of physico chemical parameters of Bonal reservoir.

A	B	C	D	E	F	G	H
Oct 99	32.28	28.92	27	6.47	48.62	0.22	0.91
Nov	28.72	27.54	29	5.52	53.29	0.25	1.16
Dec	30.35	25.40	36	6.15	50.60	0.28	1.23
Jan 00	31.35	25.82	40	6.92	77.95	0.27	0.91
Feb	34.65	29.84	38	8.46	81.39	0.04	0.45
March	38.70	32.40	37	8.50	90.75	0.05	0.34
April	39.72	34.71	42	9.21	97.54	0.04	0.28
May	48.44	34.94	43	8.94	95.48	0.04	0.19
June	37.44	32.34	26	3.75	109.79	0.12	0.24
July	34.33	30.07	28	3.45	108.37	0.15	0.33
Aug	33.85	28.30	25	4.01	98.93	0.11	0.36
Sep	33.20	27.77	24	3.68	93.59	0.17	0.48
Oct	33.48	26.52	28	6.55	59.18	0.25	1.11
Nov	34.52	27.15	29	6.04	62.72	0.27	1.26
Dec	30.90	25.10	30	6.24	57.87	0.23	1.57
Jan 01	31.70	26.20	28	6.98	87.84	0.24	0.92
Feb	34.27	29.70	32	8.12	82.13	0.10	0.54
March	37.20	32.40	38	8.64	98.78	0.05	0.46
April	39.64	34.28	42	8.92	113.53	0.06	0.44
May	40.75	34.71	43	9.15	99.73	0.03	0.45
June	37.14	32.92	29	4.02	109.16	0.14	0.23
July	34.44	30.18	28	4.41	115.44	0.13	0.30
Aug	34.47	28.45	27	4.64	105.61	0.13	0.32
Sep	33.24	27.77	26	3.70	93.13	0.17	0.38

Whereas

A=Months: B= Atmospheric.Tep in ^{0}C: C=Water.Tep in ^{0}C : D=Transparency in cm : E= Dissolved Oxygen in mg/l: F=Free Co2 in mg/l: G=Amonical nitrogen in mg/l: H= Phosphate in mg/l

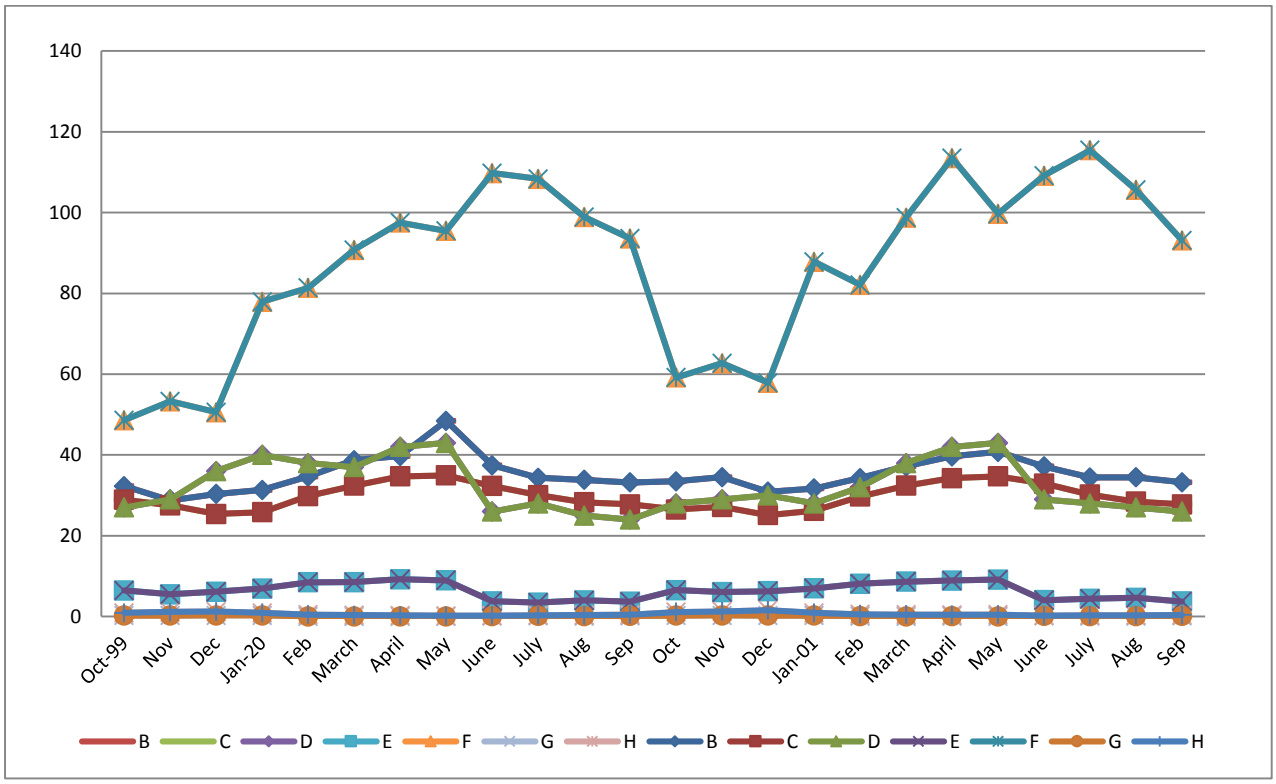

Fig.1 Monthly average values of physico chemical parameters of Bonal reservoir

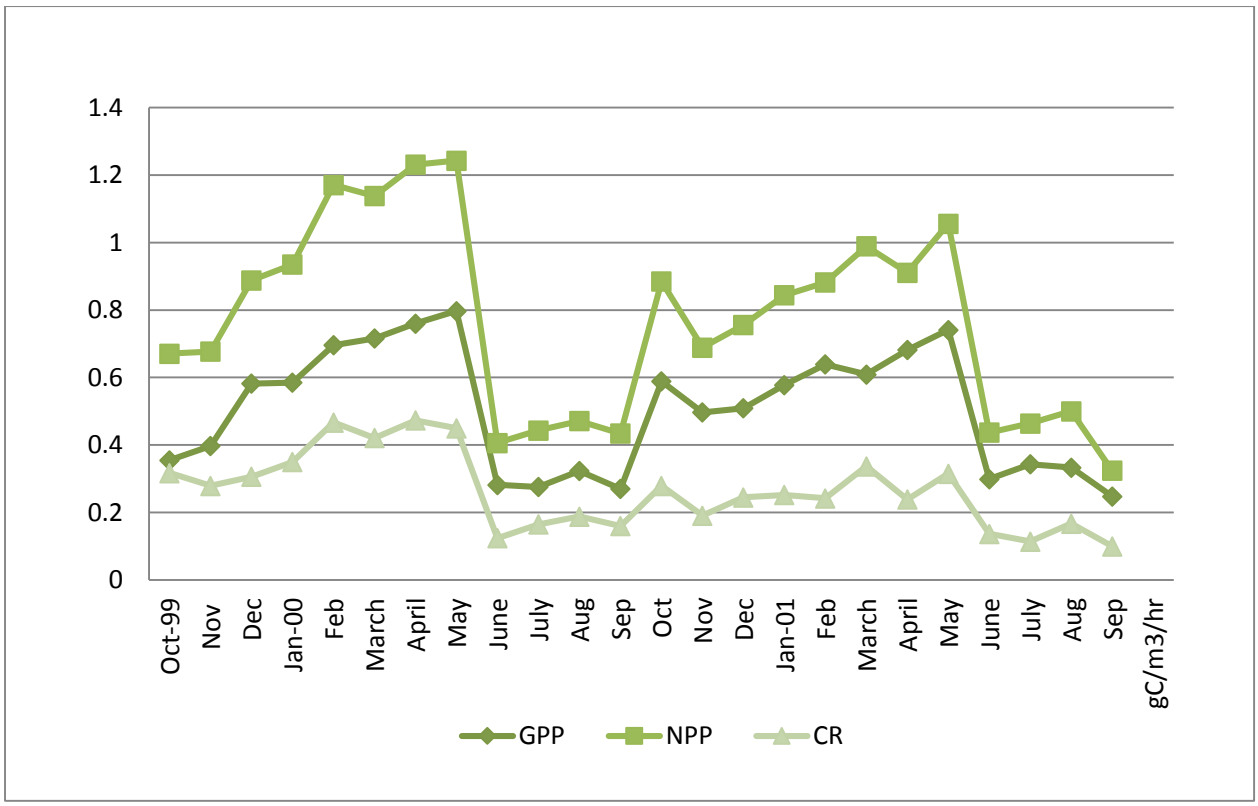

Fig 2: Monthly average values of Primary productivity of Bonal reservoir

Table 2: Monthly average values of Primary productivity of Bonal reservoir (gC/m3/hr.)

Months	GPP	NPP	CR
Oct 99	0.355	0.671	0.317
Nov	0.397	0.677	0.279
Dec	0.582	0.888	0.306
Jan 00	0.585	0.935	0.350
Feb	0.696	1.171	0.467
March	0.716	1.138	0.421
April	0.760	1.231	0.473
May	0.797	1.243	0.45
June	0.282	0.406	0.124
July	0.276	0.443	0.165
Aug	0.323	0.471	0.188
Sep	0.270	0.434	0.160
Oct	0.589	0.885	0.279
Nov	0.497	0.689	0.191
Dec	0.509	0.756	0.245
Jan 01	0.578	0.844	0.252
Feb	0.639	0.882	0.242
March	0.609	0.989	0.337
April	0.682	0.911	0.239
May	0.741	1.056	0.315
June	0.299	0.437	0.137
July	0.343	0.464	0.114
Aug	0.333	0.500	0.167
Sep	0.248	0.324	0.100

Primary productivity can be assessed as gross and net values, While Gross Primary Productivity is the total rate of Hydrogen ion concentration to synthesis including organic matter used up during respiration in a given time. Net Primary productivity is the total amount of chemical energy left after it has been utilized by plants for respiration , Primary productivity has been used as potential index of productivity for many diverse ecosystem of the world (Wetzel 2001). Primary productivity is concerned with the evaluation of the capacity of an ecosystem, to the synthesis of organic matter of high potential chemical. One of the important aspects of inland waters is the study of regional biological productivity. The voluminous data is available on such studies of temperature waters but there are only a few for Indian reservoirs, lake and ponds. The gross Primary productivity and net Primary productivity were high in Bonal reservoir due to using of fertilizers (agro chemicals) in surrounding area and these nutrients are utilized by the phytoplankton as a result the productivity is increased. The net Primary productivity of Bonal reservoir is seasonal variation in the month of June 2000 and exhibited an increased trend towards north-east monsoon season. This observation of the community respiration reveals increasing trend towards south west monsoon season. However, the relationship between decrease in PH during summer season with higher productivity reprinted by Sinha et al., (1990) could not be noticed in the present work, where as pH value in Bonal reservoir is not fluctuate. Primary productivity in Bonal reservoir observed to be moderate. Here the observation of earlier work may be mentioned (Sreenivasan 1964; Nasar and Dutta Munshi,1975 and Srivastava ; Vijayaraghavan,1971; Ponde and Singh, 1978) pertaining to water bodies of tropical India, which indicate enhanced Primary productivity in temperate water bodies (Goldman and Horne1983). It is noteworthy that increasing water temperature during summer accelerates production in the tropical ponds, which is also observed in the present study. However, the influences of other parameters which bring about fluctuations in Primary production levels of reservoir are much more ecological importance.

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