ESTIMATION OF PRIMARY PRODUCTION IN RELATION TO PHYSICOCHEMICAL PARAMETERS OF DHANEGAON RESERVOIR, OSMANABAD, MAHARASHTRA, INDIA.

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Abstract: The present investigation has been carried out to study the status of primary productivity in relation to physiochemical parameters of the Dhanegaon reservoir of Osmanabad district, Maharashtra. The primary productivity was determined by estimating gross and net primary productivity. The experiment was conducted seasonal variation during the year of June 2004 to May 2005. The physiochemical parameters such as temperature, rainfall, pH, dissolved oxygen, total hardness and total alkalinity ranged from 20.60^{C}-30.9^{C}, Nil to 217 mm, 7.2-8.3, 7.2-12.6 mg/l, 75-170 mg/l and 108-147 mg/ respectively. The monthly variation of gross primary productivity (GPP) was 124-275 gC/m3/hr, Net primary productivity 0.87-0.182 gC/m3/hr and community respiration rate was 0.025-0.137 gC/m3/hr. The results indicated that during monsoon season, organic load is coming along with water in to the reservoir, but phytoplankton growth is minimum due to the heavy rain and flushing rate was high in the reservoir. The results indicate that Dhanegaon reservoir is more productive and suitable for aquacultural activity.

Keyword: Dhanegaon reservoir Physico-chemical parpmeters, Primary productivity

Introduction

Primary production in the aquatic ecosystem starts with the synthesis of organic compounds from the inorganic constituents of water by the activity of plants in the presence of sunlight. The organic constitutions which form the raw material for the synthesis of water, carbon dioxide, nitrate ions, phosphate ions and various other chemical substances. The products are mainly carbohydrates, proteins and fats in very small quantities. Organic substances produced by plants is the first step in trapping energy by living beings from non living natural sources, and hence, called as primary productivity.

Production is generally defined as the amount of organic matter, produced by the phytoplankton under unit area of water surface. This production to essential energy from sun, for the process of photosynthesis. The production is also influenced by some physico -chemical and biological characiessitcs, which directly or indirectly affect the availability of required materials.

Primary productivity depends on the physico-chemical and biological characteristics, the production potential vary. There are several indices which can be of help to establish the utility of a water body for fishes. The high temperature to tropics helps in converting the solar energy into organic matter. Patil et.al (2015) observed that the primary production of reservoir helps to understand the tropic status and to assess the fish production potential of aquatic ecosystem3. To estimate the total biological activity of reservoir it is necessary to determine the primary production. The study of primary production in lakes and reservoir are essential to understand both water quality and fisheries4. Primary production is influenced by biotic as well as abiotic factors. Enrichment of nutrient and dry matter in the reservoir affects diversity of plankton and physico-chemical characters of water. Adeniji, F. L. A., (1990) reported that the high and low productivity values of water bodies due to the low nutrient content in the water6. Several factors, solar radiation, nutrient content, high seasonal rate of in water level and high flushing rate are influenced the rate of primary production in freshwater. For aquacultural practices it is essential to estimate primary productivity in relation to physico-chemical parameters of Dhanegaon reservoir. Therefore, the investigation was carried to measure the primary productivity of Dhanegaon reservoir for enhancing aquaculture practices, for possible utilization and sustainable management of the Dhanegaon reservoir.

Materials and Methods

Study area

Dhanegaon reservoir is constructed in 1980 on Manjara River, near village Dhanegaon. Reservoir is constructed particularly for irrigation purpose. The catchments area is about 2371 sq. kms. More than 79 villages from Beed, Osmanabad and Latur district have been benefited from this project. Besides its use in industrial, agricultural and fishery purposes, it is also the source of drinking water for entire Latur city. The Dhanegaon reservoir is large sized reservoir constructed on the Manjara river. It is 60 km away from Latur District. It is situated in Taluka Kallamb, Dist. Osmanabad. The Latur M.I.D.C. is getting water supply from it. But recently i.e. from 13th May 2005 it is supplying the drinking water to Latur district. This scheme is inaugurated by the Chief Minister of Maharashtra Mr. Vilasraoji Deshmukh.

Estimation of Primary Productivity and Physicochemical parameters

The present study was carried out from June 2004 to May 2005 for the period of one year to analyze monthly variation of primary productivity of Dhanegaon reservoir of Osmanabad district, Maharashtra. The primary productivity was estimated by 'Light and dark bottle' method suggested by Garder, T., and Gran, H.H.(1927) The physic-chemical parameters such as temperature, Rainfall, pH, dissolved oxygen, total hardness and total alkalinity were estimated methods described by APHA (1985and Trivedy and Goel (1985).

. The gross and net primary productivity was determined along with community respiration of Dhanegaon reservoir. The observed gross primary productivity (GPP), net primary productivity (NPP), and community respiration (CR) suiggested by Boyd, C.E., (1981). The primary productivity has been expressed as gross primary productivity (GPP), Net primary productivity (NPP), and community respiration (CR).

Results and Discussion

In the present investigation the physicochemical parameters such as temperature, rainfall, pH, dissolved oxygen, total hardness and total alkalinity values were ranged from 20ºC-30.9ºC, nil – 217mm, 7.2-8.3, 7.2-12.6 mg/l, 75-120 mg/l, and 108-147 mg/l, respectively it is represented in table no.1, in seasonal variation in temperature, rainfall, pH, dissolved oxygen, total hardness and total alkalinity values were range in temperature 22.45, 22.87, 25.75 ^{0}C in rainfall 147.5, 17.5, 2.75 mm, in pH 7.62, 7.57, 8.17, dissolved oxygen 8.17, 11.35, 11.45 mg/l, total hardness 98, 115.5, 96.5 mg/l, total alkalinity 118.75, 133.75, 114.75 mg/l in mansoon, winter and summer respectively it is represented in table no. 2 and figure no. 1 .

The GPP, NPP, and CR of the reservoir water are varied in month variation the values of GPP, NPP, and CR were ranged from 124-275, 0.87-0.182, and 0.025-0.137 MgO_2/l/3hrs respectively it is represented in table no. 3. The seasonal variation in the GPP were 0.155, 0.162 and 0.23 gC/m3/ hr, in NPP 0.123, 0.125 and 0.115 MgO_2/l/3hrs and CR 0.043, 0.59 and 0.115 MgO_2/l/3hrs respectively it is represented in table no. 4 and figure no. 2. The highest GPP was found in months of February and lowest was found in the month of October. The highest values of NPP were found in the month of August and lowest was September. The CR was highest in the month of February and lowest in the month of June.

Table No. 1 monthly variation in Physico-chemical parameters of Dhanegaon Reservoir during June 2004- May-2005.

Months/ Parameters	Temperature (0_C)	Rainfall (mm)	pH	DO (mg/l)	Total hardness(mg/l)	Total alkalinity (mg/l)
June	24.6	12.6	7.9	9.4	75	110
July	21.1	21.7	7.9	8.2	102	125
August	21.0	29.0	7.4	7.9	105	120
September	23.1	21.8	7.3	7.2	110	120
October	24.1	31.0	7.5	10.2	110	133
November	25.2	49.0	7.3	11.6	114	125
December	21.6	Nil	7.2	11.4	120	130
January	20.6	Nil	8.3	12.2	118	147
February	21.9	Nil	8.2	12.6	102	124
March	23.0	0.8	8.2	12.6	105	112
April	27.2	0.3	8.1	10.4	94	115
May	30.9	Nil	8.2	10.2	85	108

Table No. 2 Seasonal variation in physicochemical parameters of Dhanegaon reservoir during the June -2004 to May 2005

Season /Parameters	Temperature (0_C)	Rainfall (mm)	pH	DO (mg/l)	Total hardness (mg/l)	Total alkalinity (mg/l)
Mansoon	22.45	147.5	7.62	8.17	98	118.75
Winter	22.87	17.5	7.57	11.35	115.5	133.75
Summer	25.75	2.75	8.17	11.45	96.5	114.75

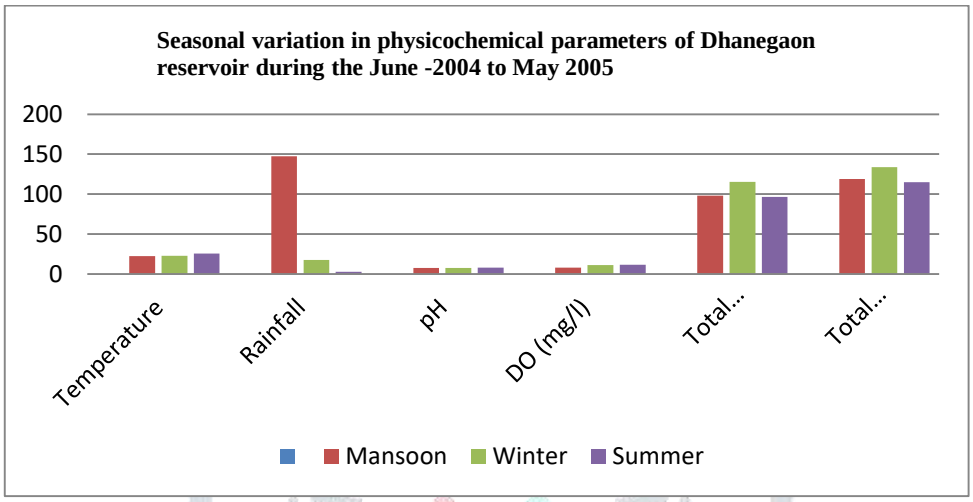

Fig. No. 1 Seasonal variation in physicochemical parameters of Dhanegaon reservoir during the June -2004 to May 2005

Table No. 3 monthly variation in the Primary productivity of Dhanegaon reservoir during the June-2004 to May 2005.

Months/ Parameters	Gross Primary Productivity	Net Primary Productivity	Community Respiration
June	0.124	0.099	0.025
July	0.174	0.124	0.050
August	0.187	0.182	0.050
September	0.137	0.087	0.050
October	0.124	0.087	0.037
November	0.174	0.137	0.037
December	0.150	0.099	0.050
January	0.200	0.087	0.112
February	0.275	0.137	0.137
March	0.275	0.137	0.137
April	0.225	0.087	0.137
May	0.150	0.099	0.050

All Values are expressed in MgO_2/l/3hrs

Table No. 3 Seasonal variation in the Primary productivity of Dhanegaon reservoir during the June-2004 to May 2005.

Season	Gross Primary Productivity	Net Primary Productivity	Community Respiration
Mansoon	0.155	0.123	0.043
Winter	0.162	0.125	0.059
Summer	0.231	0.115	0.115

All Values are expressed in MgO_2/l/3hrs

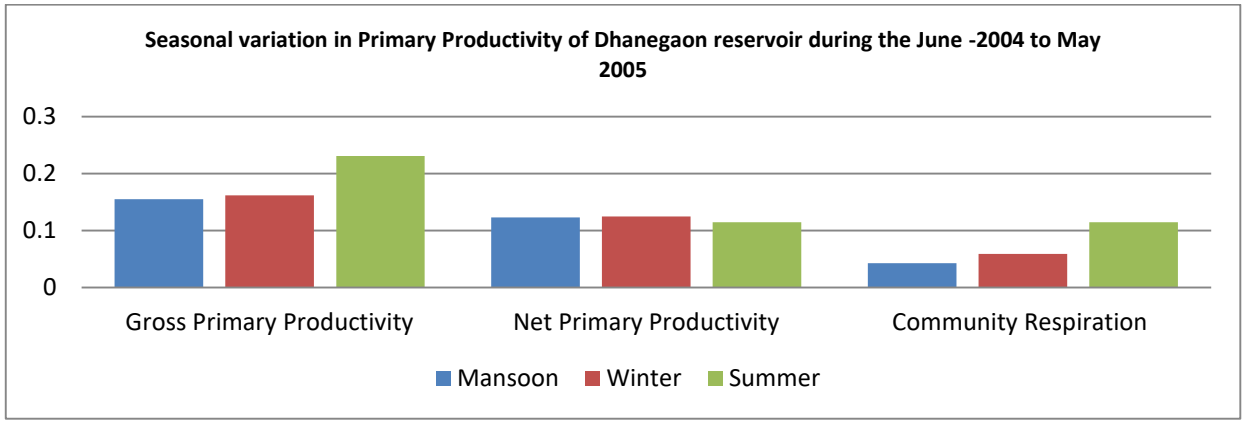

Fig. No. 2. Seasonal variation in the Primary productivity of Dhanegaon reservoir during the June-2004 to May 2005.

The GPP were highest in the months of July, august, January, February, and April and NPP were highest in the months of August and November. The temperature is increases in the summer season, which enhance the release of nutrients from organic sediments through decomposition and it provide favorable conditions for primary production. Sultan *et al*. (2003) reported that temperature, solar radiation and available nutrients may be important limiting factors for primary production and contributing to seasonal variation in aquatic ecosystem. Koli *et al. (*2011) observed that gross primary productivity (GPP) values ranged between 1.93 and 6.24 gC/m3/day, net primary productivity (NPP) ranged between 0.72and 499 gC/m3/day and community respiration (CR) ranged from 0.26 to 3.6 gC/m3/day, during September 2007 to August 2008. Above the worker similar results were represented in the present investigation. Varghese Mathew (1992) studied on Govindgrarh Lake and he reported that maximum production was obtained during summer and minimum during winter and daily net production was 0.0839 day. Reginaa and Nabi (2004) worked on physico chemical characterization of Cavery and Bhavani river at the confluence point Kooduthurai river and observed that the value of gross primary productivity was maximum 1.84 g^c/m^2 /day in March 1998 and minimum 0.80 g^c/m^3 /day in May 1998 and highest net primary productivity was 1.65 g^c/m^3/day recorded in March 1998 and least 0.72 g^c/m^3 /day in Octomber 1997, January 1998 and July 1998. She stated that, the low level of productivity was attributed to the hardness, and the high value due to the distributed presence of essential material in the water without much variation. Alaka Patil and Niranjana Chavan (2010) observed that the gross primary productivity of Bhambarde reservoir variesfrom 1.49 to 5.14 O2 mg/L/h. The highest value of GPP (5.14 O2 mg/L/h) occurred in the month of May, and the lowest value (1.49 O2 mg/L/h) in the month of August. At Lengre reservoir, GPP value ranged from 1.56 to 5.28 O2 mg/L/ h with the maximum value in month of May, and the minimum value in September. Atpadi reservoir shows GPP value varying from 1.31 to 4.98 O2 mg/L/h. In this reservoir GPP increasesin the month of May and decreases during September. N. B. Mruthyunjaya (2016) observed the primary productivity values of Ayyanakere lake. Gross primary production in Ayyanakere recorded as 4.572 gC/m3/day, 9.1464 gC/m3/day and 6.4056 gC/m3/day (Table 2, Figure-3). In the present study, as per Table- 2 GPP, NPP and CR was maximum in monsoon season and lowest in pre-monsoon season. The lowest yield was observed in pre-monsoon season when it was 4.572 gC/m3/day it is due to the decrease in the water level in the tank. Prabhakar et al (2009) reported that the primary productivity higher in winter and lower in monsoon season from Khadakwasla reservoir of Pune. Lower values are observed during monsoon might be due to increased turbidity and suspended slit content of water resulting from soil erosion from surrounding hills. Chattopadhyay and Banerjee (2008) recorded seasonal records of net production efficiency to be maximum in monsoon and minimum in winter season for Krishnasayar Lake at Burdwan. Community respiration is the rate of oxygen used by the organisms during the measuring period. According to Prabhakar et al.(2009) rate of respiration attain highest values in summer due to the effect of drainage water discharged from the different drains around the station. Basawarajeshwari Indur (2016) reported that the seasonal variation of Gross primary productivity in Mailapur reservoir showed lower in southwest monsoon (0.69±0.12) and higher in summer season (2.35±0.95), low rate of production in southwest monsoon season (0.64±0.10) and higher in northeast monsoon season (1.88±0.91)in net primary productivity, and Community Respiration showed lower values were in monsoon (0.06±0.02) and higher values in winter season (0.30±0.11) (gC/m3 /hr) respectively.

Conclusion:

From the above results the Dhanegaon reservoir is a productive reservoir and influence the physic-chemical parameters within the limit for growth of phytoplankton. The primary production is increases in the winter and summer season due to the influences the temperature. Temperature is play the major role in the distribution and growth in phytoplankton. The primary production were influence by the organic runoff from agriculture and nutrient coming along with the rain water during monsoon season so the reservoir is using for the aquacultural practices and the water of the reservoir is using industries and drinking purposes after proper treatment.

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