Estimation of Primary Productivity of Kundrala Medium Project- A Freshwater Reservoir of Mukhed, District- Nanded (Maharashtra) - India.

Janhavi R. Shiurkar[1], Sudhir V. Shivanikar[2], Anand R. Ashturkar[3].
1,2,3 Department of Environmental Science, Netaji Subhashchandra Bose College, Nanded.

Abstract: Present study deals with the physicochemical status of Kundrala medium project at Mukhed in Nanded District of Maharashtra with special reference to the Primary productivity. The primary productivity were determined for a period of two years from June 2016 to May 2018. In the present investigation seasonal variations in the primary productivity were minimum in the winter season, moderate in the rainy season and highest in the summer season during the both years. The annual average of GPP varied from spot A70.72 to 160.0 mgC/m3/hr, 71.0 to 161.4 mgC/m3/hr at spot B, 69.5 to 156.3 mgC/m3/hr at Spot C and 71.5 to 160.5 mgC/m3/hr at Spots D dutring the year of 2016 to 2017 and in the next annual average of GPP varied from 69.72 to 158.5 mgC/m3/hr at Spot A, 68.75 to 157.25 mgC/m3/hr at spot B, 66.3 to 154.2 mgC/m3/hr at spot C and 69.7 to 157.5 mgC/m3/hr at spot D respectively. The correlation of GPP with some of the physicochemical parameters. Hence the present water body is found unpolluted during these two years and the water is used for water supply for nearby localities and also for irrigation purposes and for economic development and also used for aquaculture.

Key Words: kundrala, Primary productivity, Gross Primary productivity.

I. INTRODUCTION:

Primary production refers to the amount of organic matter made from inorganic materials through the process of photosynthesis. Primary producers are organisms able to use inorganic nutrients through the process of photosynthesis to build organic matter. Thus, primary producers, in order to live and grow need essential nutrients such as nitrogen, phosphorus, magnesium, calcium, iron, zinc, etc. in sufficient amounts. The main types of primary producers in lakes and reservoirs are phytoplankton, macrophytes, and periphyton. The primary productivity of a water body is the manifestation of its biologicalproduction. It forms the basis of the ecosystemfunctioning. It plays an important role in any ecosystem as it makes the chemical energy and organic matters available to the entire biological community (Ahmed *et al.*, 2005). The estimation of primary productivity is predicted on the relationship between oxygen evolution and carbon fixation.Primary productivity varies from stream to stream on the stretch of a river due to increase in oxygen demanding pollutants or photosynthetic inhibiting pollutants, particularly more in the downstream (Sahu *et al.,1995).* Melack, J. M. (1976) McConnell, W. J., and Oglesby, R. T. (1977) stated that the measurement of primary production or photosynthesis is helpful to understand the trophic status and to assess the fish production potential of aquatic ecosystem. The rate of production of organic matters per unit time is termed as productivity. Measurement of primary productivity gives information regarding the photosynthetic production of organic matter in an area per unittime and the functional aspects of ecosystem (Odum, 1971). No such study was carried out with reference to primary productivity from this Kundrala project hence, present investigation was attempted. This study may be

helpful in enhancing aquaculture practices, optimum utilization and sustainable management of the Kundrala project at Mukhed District- Nanded (Maharashtra).

II.STUDY AREA:

The site selected for the Research work is Kundrala Medium Project. Kundrala is a village in Mukhed Taluka in Nanded District of Maharashtra State, India. It belongs to Marathwada region and Aurangabad Division. It is located 70kms towards South from District head quarters Nanded and 12 kms from Mukhed. The purpose of Kundrala medium project is Irrigation as well as multipurpose i.e. drinking and other recreational use.Kundrala dam is earthfill dam on local river/ Nallah. Main basin is Godavari and sub basin is Upper Godavari. The total catchment area is 86.25 sq.kms. The Gross Command Area GCA(Ha) is 1307, Culturable Command Area CCA(Ha) 1265, and Irrigable Command Area ICA(Ha) is 1012. The average annual rainfall near dam is 764mm and the annual Evaporation in mm3 is 3.65. The height of the dam above lowest foundation is 18.5 m (61 ft) while the length is 999 m (3,278 ft). The volume content is 370 km^3 (89 cu mi) and gross storage capacity is 14,680.00 km^3 (3,521.92 cu mi)

III. MATERIALS AND METHODS:

Water samples were collected at monthly intervals for a period of two years i.e. June 2016 to May 2018 between 8.00 AM to 5.00 PM from four sampling sites A, B, C, D of Kundrala medium project. APHA, Standard methods for the examination of water and waste water for analysis. The present investigation of monthly variation in primary productivity was studied at surface water of the Kundrala medium project at Mukhed at four sampling sites during June 2016 to May 2018. Physico- chemical parameters of water samples were analyzed APHA, AWWA and WEF (2012) and primary productivity was estimated by 'Light and Dark Bottle' method Garder T. and Gran H.H. (1927).The primary productivity has been expressed as gross primary productivity (GPP) .

Calculations for Primary Productivity:

Initial DO = Z mg/L

Light bottle DO after incubation period (3 hrs.) = X mg /L

Dark bottle DO after incubation period = Y mg/L

1. Gross photosynthesis = X – Y mg/L
2. Gross Primary Productivity (mg C/L/hr) = $\frac{(X - Y) \times 0.536}{PQ \times N}$

Where, PQ = 1.2 (Photosynthetic quotient)

N = Incubation period

0. 536 = Factor to convert mg O_2 to mg of C

IV- RESULT AND DISCUSSION:

In the present investigation the primary productivity of Kundrala medium project monthly variation at spots A 70.72 to 160.0 mgC/m3/hr, 71.0 to 161.4 mgC/m3/hr at spot B, 69.5 to 156.3 mgC/m3/hr at Spot C and 71.5 to 160.5 mgC/m3/hr at Spots D during the year of 2016 to 2017. The results are shown in the table no. 1 and figure no. 1. In the next year monthly variation in primary productivity 69.72 to 158.5 mgC/m3/hr at Spot A, 68.75 to 157.25 mgC/m3/hr at spot B, 66.3 to 154.2 mgC/m3/hr at spot C and 69.7 to 157.5 mgC/m3/hr at spot D respectively. The results are shown in the table no. 2 and figure no. 2.

Table no. 1. Monthly mean values of Productivity (mgC/m3/hr) of Kundrala medium project during June 2016 to May 2017.

Months/Sites	A	B	C	D
June	78.10	77.5	74.4	77.5
July	75.30	75.5	73.0	75.0
August	70.72	71.0	69.5	71.5
September	135.3	135.3	131.3	135.5
October	80.7	80.25	76.2	80.0
November	72.5	72.5	68.4	72.5
December	98.2	98.5	95.4	98.5
January	105.5	105.5	101.3	104.0
February	142.5	141.3	138.3	141.5
March	140.0	141.5	137.2	140.5
April	156.0	155.5	152.2	155.2
May	160.0	161.4	156.3	160.5

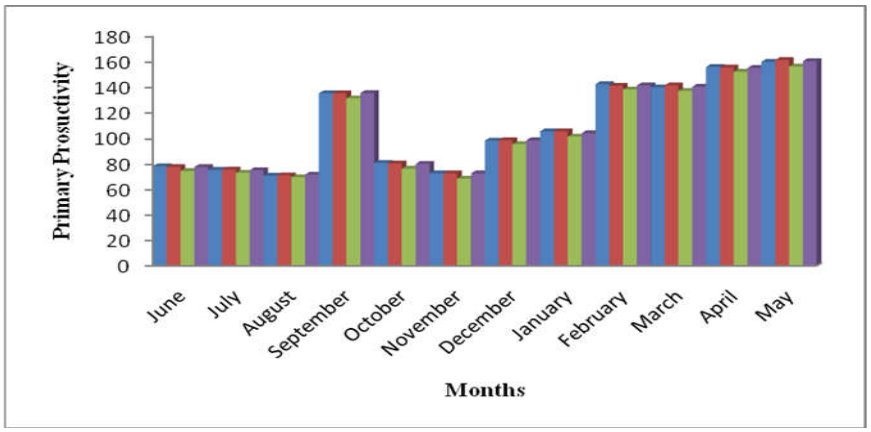

Fig. No. 1. Monthly mean values of Productivity (mgC/m3/hr) of Kundrala medium project during June 2016 to May 2017.

Table No. 2. Monthly mean values of Productivity (mgC/m3/hr) of Kundrala medium project during June 2017 to May 2018

Months/Sites	A	B	C	D
June	78.25	70.5	68.5	70.6
July	75.75	73.3	69.4	72.5
August	69.72	68.75	66.3	69.7
September	137.25	137.0	135.1	137.5
October	82.5	82.0	78.2	82.0
November	75.5	75.0	73.1	75.0
December	97.5	98.0	95.2	98.0
January	112.5	111.5	109.3	112.5
February	131.5	130.5	129.4	132.5
March	130.2	131.25	128.2	130.2
April	158.5	157.25	154.2	157.5
May	156.4	156.5	153.2	157.2

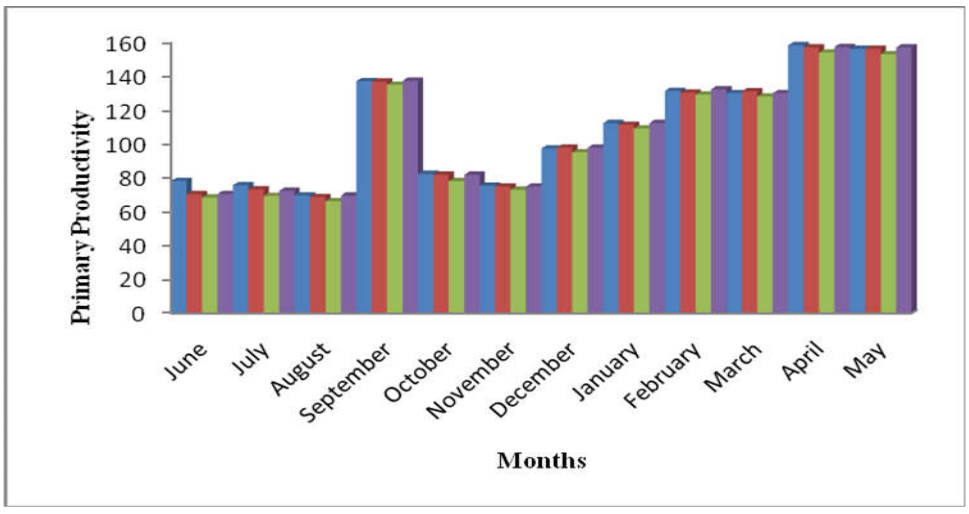

Fig. No. 2. Monthly mean values of Productivity (mgC/m3/hr) of Kundrala medium project during June 2017 to May 2018

In the present investigation seasonal variation in the GPP were minimum in the winter season and moderate in the rainy season and maximum in the summer season. The station-wise analysis indicated minimum productivity in the month of August during the year 2016-2017 in all stations, therefore, in the same period, average GPP of Kundrala medium project was low. At Spot –A, GPP was maximum (160 mgC/m3/hr) during May 2017, at spot - B it was (161.4 mgC/m3/hr) in the month of May 2017, at Spot C it was (164.5 mgC/m3/hr) during the month of May 2017 and at spot – D it was (160.5 mgC/m3/hr) during the month of May2017.

The spot-wise analysis indicated minimum productivity in the month of August during the year 2017-2018 in all stations, therefore, in the same period; average GPP of Kundrala medium project was low. At Spot –A, GPP was maximum (158.5 mgC/m3/hr) during April 2018, at spot - B it was (157.25 mgC/m3/hr) in the month of April 2018, at Spot C it was (154.2 mgC/m3/hr) during the month of April, 2018 and at spot – D it was (157.5 mgC/m3/hr) during the month of April, 2018. The study also reported gradual increase in GPP from January to May and decline from June to December of both years. Similar observation were made by many researcher Mitsch, W. J.and J. G. Gosselink (1993), Chattopadhyay, C. and T. C. Banerjee (2008), Sontakke, G. K. and S. S. Mokashe (2014) stated that higher primary productivity due to high light penetration during pre- monsoon season. The decreased respiration rate during winter was linked with low water temperature and reduced light which affects the rate of photosynthetic efficiency (Nasar and Datta Munshi, 1975; Datta *et al.*,1984; Ahmad and Singh, 1987). The ratio of net and gross primary production is important for the evaluation of the amount of gross production available to the consumer (Singh and Singh, 1999). Higher production is not governed by a single factor as stated by Singh and Singh, (1999). There are several environmental factors acting simultaneously which must be taken into consideration while evaluating the production capacity of an aquatic ecosystem. Khan (1980) found seasonal variation in gross primary productivity in Dharuria lake. The first peak appeared during March and the second during November. Relatively low values were noticed during monsoon. Synudeen Sahib (2002) reported that the highest value of GPP and NPP are in the month of April at Parapper reservoir of Kollam district in Kerala. The same observation is found in the present investigation at Kundrala medium project. In the present investigation the GPP are minimum in the months of June to September, slightly increases in the months of October to January and maximum in the months of February to May. Seasonal variation in the GPP of Kundrala medium project were minimum in the rainy season , slightly increases in the winter season and maximum in the summer season during the both years. Mandal *et al*. (2005) also obtained the gross and net productivity fluctuating to increase from late winter and reaching peak in the late summer in Karwar lake, Bihar. Similar results were recorded by Hujare *et al.* (2007) in two perennial tanks from Kolhapur district. They observed highest values of GPP

and NPP in the month of April, and lowestvalues in September. Lokhande and Shembekar (2011) studied on estimation of primary productivity of Dhanegaon reservoir dist- Osmanabad, Maharashtra and they stated that the GPP was minimum in summer season while maximum in winter season. The minimum and maximum vales of GPP it is decline nature of productivity during rainy season could be due to dilution of nutrients, cloudy weather and high sunshine.

In the present investigation the productivity of Kundrala medium project increased from winter months and attains the highest in summer months and then minimum in monsoon months. The highest rate of productivity during summer season probably due to bright sunlight and higher temperature. Prasad & Nair (1963), Sreenivassan (1964) and Singh *et al.* (1996) have reported highest rate of productivity during summer season. Vijaykumar (1994) showed similar observations that increase in water temperature and alkalinity from March onwards accelerated the primary production.

V-Conclusion

In the present investigation the Gross Primary productivity of Kundrala medium project seasonal variation in GPP were increased in the summer season and then minimum in rainy season. The highest rate of productivity probably due to bright sunlight and higher temperature.

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