International Journal of Fisheries and Aquatic Studies 2015; 2(6): 99-103

ISSN: 2347-5129
IJFAS 2015; 2(6): 99-103
(ICV-Poland) Impact Value: 5.62
(GIF) Impact Factor: 0.352
© 2015 IJFAS
www.fisheriesjournal.com
Received: 19-05-2015
Accepted: 18-06-2015

Puspendra Singh Sengar
Department of Aquaculture Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences 5-Budherhat Road, Chakgaria, P.O. Panchasayar, Kolkata – 700 094.

S. K. Das
Department of Aquaculture Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences
5-Budherhat Road, Chakgaria, P.O. Panchasayar, Kolkata – 700 094.

Sanjeev Kumar
Department of Fisheries Resource Management
Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences
5-Budherhat Road, Chakgaria, P.O. Panchasayar, Kolkata – 700 094.

Rinku Gogoi
Department of Fisheries Resource Management
Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences
5-Budherhat Road, Chakgaria, P.O. Panchasayar, Kolkata – 700 094.

S. Behera
Department of Fisheries Resource Management
Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences
5-Budherhat Road, Chakgaria, P.O. Panchasayar, Kolkata – 700 094.

Correspondence
Puspendra Singh Sengar
Department of Aquaculture Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences 5-Budherhat Road, Chakgaria, P.O. Panchasayar, Kolkata – 700 094.

Evaluation of soil quality of some Reservoir fisheries in Dhaulpur district of Rajasthan

Puspendra Singh Sengar, S. K. Das, Sanjeev Kumar, Rinku Gogoi, S. Behera

Abstract
The present investigation deals with evaluation of soil quality of some reservoir of the Dhaulpur district in Rajasthan during January to June, 2011. **S**oil reaction was found to be alkaline in all the reservoirs studied with values ranged from 7.3 to 8.02. The minimum and maximum values of specific conductivity of soil encountered were 177 µmhos in Baripura reservoir and 320 µmhos in Bansrai reservoir respectively. The maximum value (0.88 %) was encountered in Chilachond and minimum value (0.15 %) in Aagai reservoirs respectively. The average values of soil organic carbon were 0.509 ± 0.2482 %. The reservoir bottom is often rich with organic sediments as well as benthic communities. The stocking with more bottom feeding fishes will certainly increase production in general. Available phosphorous of bottom soil, minimum and maximum values of 0.22 mg/100g soil and 0.69 mg/100g soil of were encountered in Aagai and Chilachond reservoirs respectively. Water retentivity of the reservoirs was not a function of soil characteristic; rather it was determined by the water abstraction for irrigation purposes in the agricultural farming sector.

Keywords: Reservoir, soil quality, specific conductivity and phosphorous.

1. Introduction

India has a large spread of fresh water resources in the form of rivers, reservoirs, lakes and ponds etc. Indian reservoirs, being in the tropics have high primary productivity and have the capacity to produce more fish than their present low Indian average of 29.7 kg/ha/yr in reservoirs. Reservoir fisheries are essentially a stocking cum capture system. There are 193750reservoirs in the country with a total area of more than 3.15 million hectares.

Rajasthan is one of the Border States of India, sharing the country's frontier with Pakistan in the west and northwest. The State encompassing an area of 3, 42, 239 km^2 shows great physiographic variations. Rajasthan possesses a large number of water bodies, which offer potential for development of capture and culture fisheries. State has freshwater as well as saline water resources. It has about 4.23 lakh ha Freshwater area besides 30,000 ha. area as rivers and canals, 80000 ha. Waterlogged and 1.80 lakh ha. salt affected areas at full tank level (Directorate of Fisheries, Rajasthan, 2009) [3].

At the present level of management, the average yield from the Indian reservoirs is about 20 kg/ha, whereas a production of 50-100 kg/ha can easily be achieved from large and medium reservoirs, while the small reservoirs have the potential to yield even 100-300 kg/ha. Rapid fluctuation of reservoir water level, which is common especially in irrigation reservoirs, has been the primary cause of low yields of Indian reservoirs (Jhingran, 1988) [9]. The average fish yield of 24.89 kg ha^{-1} from the reservoirs of Rajasthan is one of the highest in India.

Benthic fauna shows an erratic distribution in Indian reservoirs. The main factors that retard this community are the predominantly rocky bottom, frequent water level fluctuation and the rapid deposition of silt and other suspended particles. Reservoirs of Karnataka, such as Tungabhadra, Markonahalli, Hemavathy, Vanivilas Sagar and Krishnarajasagar have impressive populations of benthic organisms, so are the reservoirs of Himachal Pradesh and Rajasthan. Among the biotic communities of the reservoir ecosystem, periphyton is the least reported upon. It constitutes an important component of food for the browsing fishes which contribute substantially to the total fish biomass of the tropical reservoirs. Propensities for rich settling rates of periphyton have been established through experiments with the artificial substrata, such as glass slides (David *et al.*, 1975; Jha, 1979; Sugunan and Pathak, 1986) [4, 8, 15].

2. Materials and Methods

2.1 Study area: The present study has been carried out during January to June, 2011 in the Dhaulpur district (Latitude: 26° 42' N and Longitude: 77° 53' E) of Rajasthan (Latitude: 27° 00' N and Longitude: 74° 00' E) as the reservoirs in this district is heterogenous in nature with regard to their area, water retentivity and fisheries management. As there is variability in the nomenclature of big water bodies like, reservoirs, bunds, irrigation tank etc., in the present study a general terminology, r*eservoir*, for all the water bodies irrespective of their sizes were used throughout. Twenty reservoirs were selected randomly from all the four blocks namely Bari, Baseri, Dhaulpur, and Rajakhera. The distribution of water bodies were as follows (Table 1).

Table 1: Distribution of water bodies selected from all the four blocks of Dhaulpur district.

Sl. No.	Block	Number of Water bodies
1.	Bari	8
2.	Baseri	3
3.	Dhaulpur	6
4.	Rajakhera	3

2.2. Protocol of the study: The study was designed to generate data from sampling for determining morphometric and physico-chemical status of the reservoir fisheries in Dhaulpur district of Rajasthan, the schedule for the sampling and survey work has been conducted from January to June, 2011.

Soil quality analysis:

pH: The pH was determined with a digital pH meter (ADCO) using 1:2 suspensions of soil and water (Jackson, 1967) [7].

Organic carbon: For estimation of organic carbon, air-dried powdered sediment sample (500 mg) was digested with 1 N $K_2Cr_2O_7$ (20 ml) and concentrated H_2SO_4 (20 ml) and kept for 30 minutes at dark. The digested sample was then diluted with 150 ml distilled water and 10 ml ortho-phosphoric acid and 1 ml diphenyl amine indicator was added. It was then titrated against 0.5 N ferrous ammonium sulphate (Mohr's salt) until brilliant green colour appeared (Walkley and Black, 1934) [16].

2.3 Available phosphorus: Available phosphorus was determined using 1:20 soil to Olsen's extractant (0.5 $NaHCO_3$ adjusted to pH 8.5) (Olsen *et al*., 1954) [11] followed by Dickman and Bray's (1940) [5] chlorostannous reduced molybdophosphoric blue colour method in hypochloric acid system as described by Jackson (1967) [7].

2.4 Specific Conductivity: For specific conductivity estimation, soil: water suspension (1:2) was prepared and the suspension was intermittently stirred for half an hour. Specific conductivity was determined with the help of an EC bridge, also known as conductivity meter (Systronics 304 serial number 6312).

2.5 Statistical analyses: The data were statistically analysed. Correlation-coefficient between the parameters influencing productivity was applied following the methods of (Gomez and Gomez, 1984) [6] and their fitted relationship were made using appropriate software.

3. Result and Discussion

3.1. Soil quality parameters

3.1.1 pH: Soil reaction was found to be alkaline in all the reservoirs studied with values ranged from 7.3 to 8.02 (Figure 1). The sediment of the reservoirs under study exhibited pH in the alkaline range as expected in tune with the surface water pH values (Sugunan, 1995) [13]. Jhingran (1989) [10] also recorded the soil pH ranging from 7.80- 8.65, during study of limnochemical features of Chhaparwara reservoir and in Ramgarh reservoir (Jaipur) the soil pH ranged from 7.4- 8.6.

3.1.2 Specific conductivity (µmhos): Specific conductivity of soil reflected an identical trend to that of specific conductivity (S.C.) of water and the variation was more than 1.8 times among the reservoirs. The minimum and maximum values encountered**,** were 177 µmhos in Baripura reservoir and 320 µmhos in Bansrai respectively. The average S.C. values were 232.05 ± 43.5 µmhos. The low Specific conductivity (188.55 µmhos**)** was found in four of the reservoirs, whereas, Moderate Specific conductivity (188.56-275.4 µmhos) was observed in 60 % of all tested water bodies and high was revealed in four water bodies (Figure 2).

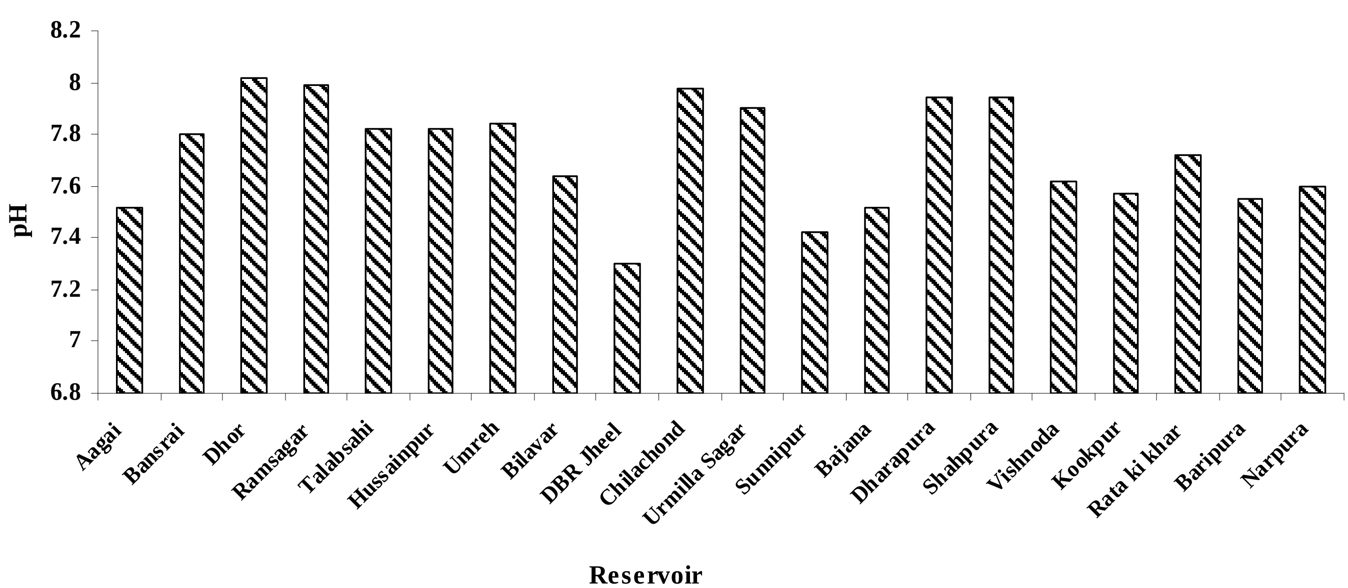

Fig 1: pH of soil in all the reservoirs

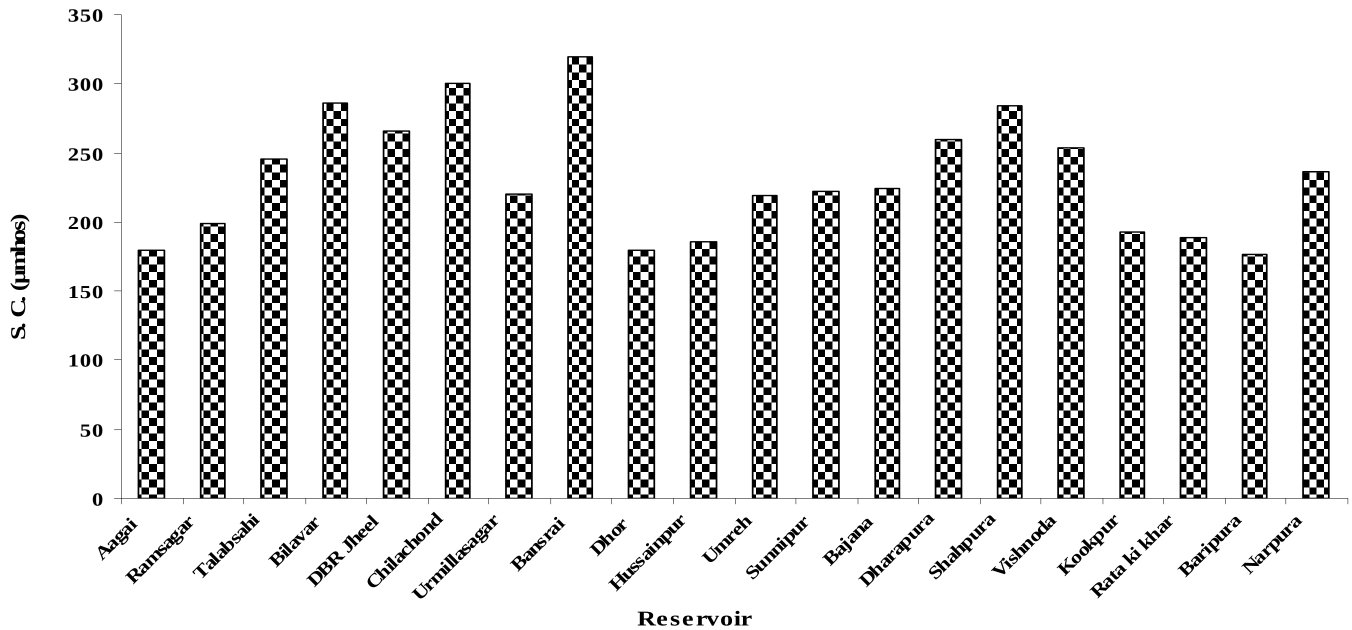

Fig 2: Specific conductivity of soil in all the reservoirs.

The productivity indices like dissolved organic matter, orthophosphate, specific conductivity etc. exhibited distinct variations where the values were comparatively higher in smaller reservoirs like Bilavar, DBR Jheel, Chilachond, Talabsahi than the big ones. It indicated that small reservoirs were tended to be eutrophic than the meso-oligotrophic big reservoirs under the present study. This is in conformity with earlier studies of Sharma (1980) who recorded the specific conductivity values of Baghala, Namana, Anasagar, Fatehsagar, Chhaparwara reservoirs waters as ranging in 422.9 – 547.3 µmhos, 379.3 – 472.7 µmhos, 410.5 – 475 µmhos, 255 – 541.1 µmhos, and 567 – 690 µmhos, respectively. The specific conductivity of Vallabhsagar reservoir in Gujarat ranged from 41 – 585 µmhos, (Anon, 1980) [1]. Specific conductivity of both water and sediment in general, exhibited a strong positive correlation with fish production and the relationship has been explained by 91 – 97 %. It indicated that there is enough scope for increasing production through the input of inorganic ions by addition of fertilizers, manures and liming so as to increase the specific conductivity of the system.

3.1.3 Organic Carbon (%): Organic carbon of the bottom sediments varied by a factor of 5.8 among the reservoirs during the period of investigation. The maximum value (0.88 %) was encountered in Chilachond and minimum value (0.15 %) in Aagai respectively. The average values of soil organic carbon were 0.509 ± 0.2482 %. High organic carbon (0.857 % and above) was found in 5 % of the reservoirs and low organic carbon (up to 0.261 %) was found in 30 % of water bodies and moderate organic carbon (0.262-0.856 %) was found in 65 % of water bodies (Figure 3).

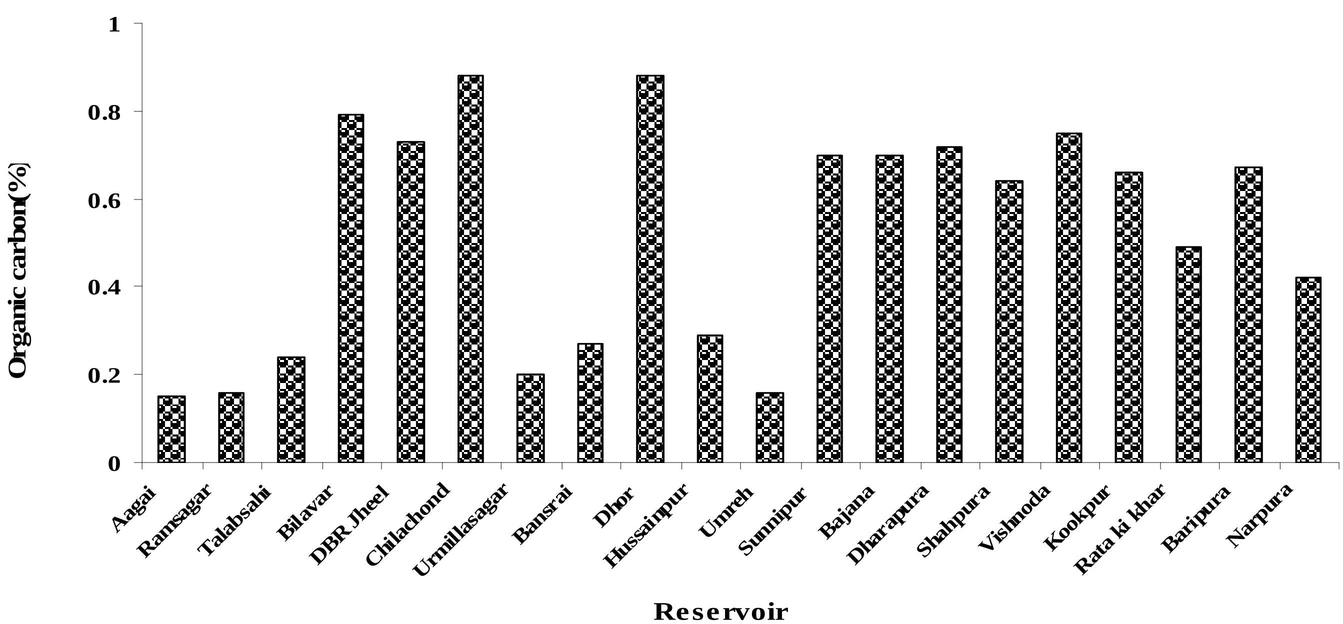

Fig 3: Organic carbon of soil in all the reservoirs

The organic carbon of the sediment in the present study varied between 0.15 and 0.88 %, which indicated the poor status of productivity in general as Banerjee (1967) [2] suggested optimum organic carbon content to be ranging from 1.5 to 2.5 %. The variation in organic carbon is mainly dependent on the quality of macrophytes present in the beels and their magnitude of decomposition (Sugunan and Bhattacharya, 2000) [14]. Jhingran (1989) [10] recorded the organic carbon 0.15 % - 1.05 % in Ramgarh reservoir during the study of limno-chemical features of the reservoir.

As, the reservoir bottom is often rich with organic sediments as well as benthic communities (Sugunan, 1995) [13] the stocking with more bottom feeding fishes will certainly increase production in general. As reservoir like Aagai and Ramsagar encountered mahseer in the catch, it was because of their connection with some rivers coming downwards from the hills. Therefore, such hill stream fishes in those reservoirs were more likely.

3.1.4 Available Phosphorous: Available phosphorous of bottom soil varied by a factor of 3.13 times among the reservoirs studied during the period of investigation. The minimum and maximum values of 0.22 mg/100g soil and 0.69 mg/100g soil were encountered in Aagai and Chilachond respectively (Figure 4). Most of the reservoirs (75 %) were having moderate soil available phosphorous (0.253 - 0.51 mg/ 100g soil), 5 % with low available phosphorous (up to 0.252 mg/ 100g soil) and 20 % with high available phosphorous (0.52 and above mg/100g soil). Jhingran (1989) [10] recorded the phosphates of water and sediment as 0.052 mg/l and 0.4 – 1.1 mg/ 100g soil respectively in Ramgarh reservoir (Jaipur) of Rajasthan

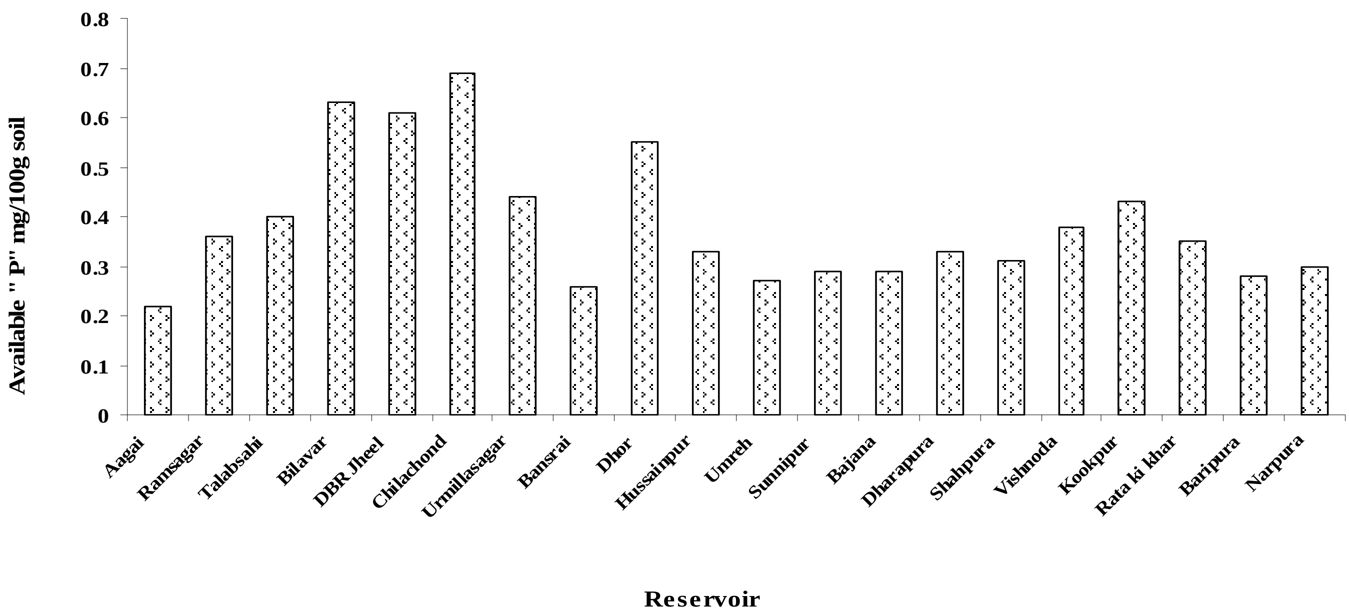

Fig 4: Available phosphorus of soil in all the reservoirs

4. References

1. Anon. Proceedings of the Sixth Workshop of all India Coordinated Project on Ecology and Fisheries of Fresh Water Reservoirs, Simla 25- 26 November 1980, Central Inland Fisheries Research Institute, Barrackpore, West Bengal, India, 1980, 66.
2. Banerjee SM. Water Quality and Soil Condition of Fish Ponds in some States of India in Relation to Fish Production. Indian J. Fish 1967; 14(1-2):115-144.
3. Directorate of Fisheries. Rajasthan, Newsletter, Facilities given to fish farmers under National Agriculture Development Plan, Prakash publisher, Bharatpur 2009, 2012.
4. David A, Rao NGS, Raghavan SL. Preliminary observation on the periphyton production in lentic water mass. Indian J. Exp. Biol 1975; 13(2):205-208.
5. Dickman SR, Bray RH. Colorimetric Determination of Phosphate. Ind. Eng. Chem. Anal. Ed 1940; 12(11):665-668.
6. Gomez KA, Gomez AA. Statistical procedures for agricultural research (II edition). A Wiley Inter – science Publication, New York, 1984, 680.
7. Jackson ML. Soil Chemical Analysis, Prentice Hall of India Pvt. Ltd. New Delhi, 1967, 498.
8. Jha BC. Qualitative composition and seasonal abundance of periphyton in Getalsud reservoir. In Proceeding of the Summer Institute on capture and culture fisheries of manmade lakes in India, 7 July-6 August, 1979. CIFRI, Barrackpore, India, 1979, 120-125.
9. Jhingran AG. Reservoir fisheries management in India. Bulletin 45, Central Inland Capture Fisheries Research Institute, Barrackpore, India, 1988, 68.
10. Jhingran AG. Limnology and production biology of two man-made lakes in Rajasthan (India) with management strategies for their fish yield optimisation. Final Report, IDA Fisheries Management in Rajasthan, Central Inland Capture Fisheries Research Institute, Barrackpore, India, 1989, 1-63.
11. Olsen S, Cole C, Watanabe F, Dean L. Estimation of available phosphorus in soils by extraction with sodium bicarbonate. USDA Circular Nr 939, US Gov. Print. Office, Washington, D.C, 1954.
12. Sharma LL. Some limnological aspects of Udaipur waters in comparison to selected waters of Rajasthan. Ph. D. thesis submitted to the University of Udaipur, New Campus Udaipur-313001, India, 1980, 251.
13. Sugunan VV. Reservoir Fisheries of India, FAO Fisheries Technical Paper No. 345. Rome, FAO, 1995, 423.

14. Sugunan VV, Bhattacharya BK. Ecology and Fisheries of beels in Assam. Bulletin no. 104, Central Inland Capture Fisheries Research Institute, Barrackpore, West Bengal, India, Nov, 2000, 55.
15. Sugunan VV, Pathak V. Temporal and spatial distribution of periphyton in Nagarjunasagar reservoir, Andhra Pradesh (India) and a new method for periphyton collection from Indian reservoirs. J. Inland Fish. Soc. India 1986; 18(2):20-33.
16. Walkley A, Black IA. An examination of the Degrjareff method for determining soil organic matter and a proposed modification of the chromic acid titration method. Soil Sci 1934; 37:29-38.