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Nutrient status evaluation of Nagzari dam water of Maharashtra

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ABSTRACT

Nagzari dam (Lat. 19^0-36'- 0" N and Long. 78^0- 16'- 0" E) in Kinwat tahsil , Nanded district is one of the latest additions to the string of dam dotting the Satmala and Nirmal Ghats zone in Maharashtra. Nutrient status is widely regarded as a reliable index of dam fertility. Scientific understanding of the production potential of dam is a prerequisite for utilizing these water bodies for drinking, irrigation, domestic and aquaculture etc. Not much information is available on nutrient status of such ecosystems in our nation. The present study represents an attempt to know the nutrient status of the Nagzari dam and its systematic evaluation. The parameters like Nitrite-Nitrogen and Phosphate and their data gathered from two stations of the dam during July 2005 to June 2007. The values of Nitrite-Nitrogen and Phosphate were found to be in the range of 0.80 to 7.5, 0.90 to 7.8 and 0.19 to 0.87, 0.20 to 0.90 mg/L respectively.

Key words: Chemical Parameters, Nutrient, Nagzari dam, Nitrite-Nitrogen, Phosphate.

INTRODUCTION

For normal and healthy growth of plants more than twelve elements such as Carbon, Oxygen, Hydrogen, Nitrogen, Phosphorous, Potassium, Calcium, Magnesium, Iron, Zinc, Manganese, Molybdenum, and Sulphur etc. are essential. These are called plant nutrients. Out of these elements, Carbon, Hydrogen, Oxygen and a part of Nitrogen are drown from the inexhaustible air and water. The remaining elements including nitrogen are supplied by soil. Nitrogen, Phosphorous and Potassium are regarded as essential plant nutrients and are consumed in large quantities. Other elements are required in minute quantities by plants and are termed as secondary nutrients. Hence, this study contains the Nitrate and Phosphate status of Nagzari dam of Maharashtra state.

India is a predominantly agricultural country. Its rural economy completely depends on agriculture. The sources of irrigation in country are rainfall, surface water and ground water. In Nanded district, particularly the Kinwat taluka, the surface water and ground water are the major sources for irrigation and drinking. The Nagzari medium project mainly constructed for irrigation and aquaculture. But few years before it was reserved for drinking water supply to Kinwat city near about lakh of population and others.

Both the nutrients in low concentrations are not likely to causes any harm to man and animals. According to APSFSL "Phosphate is essential constituent of bones and some enzyme systems" [2]. If the phosphate is consumed in excess, phosphene gas is produced in the gastrointestinal tract on reaction with gastric juice. This could even lead to the death of consumers.

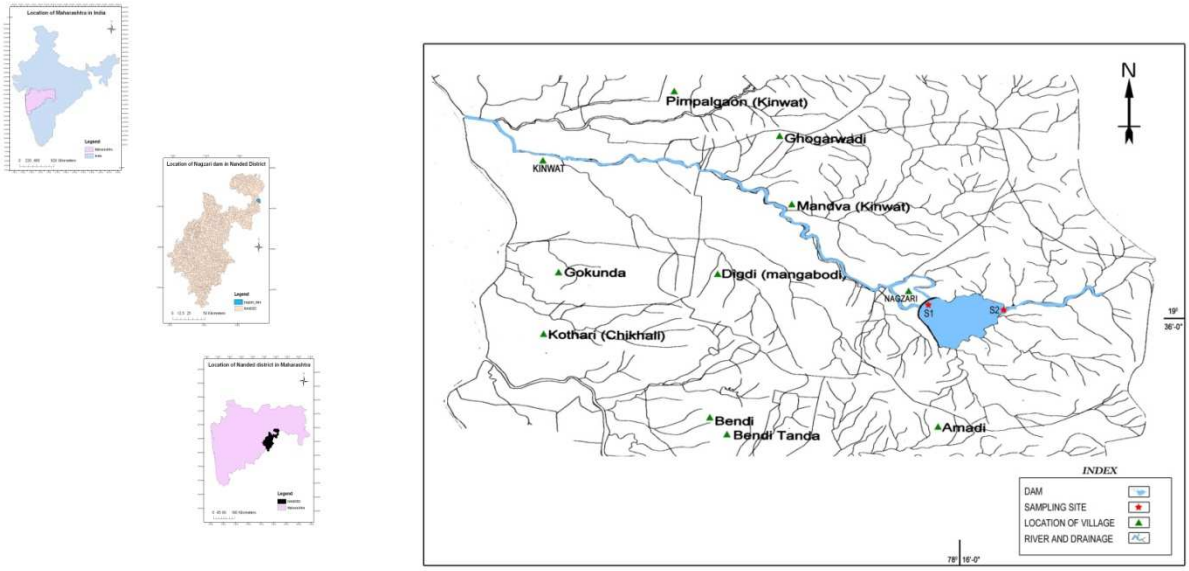
Excess concentration of nitrate in drinking water has led to numerous cases of methamoglobinaemia in infants. Some nitrosamines, formed by the reduction of nitrate with secondary amines are suspected to be carcinogenic. The studies of brought out valuable information on ecology and nutrient distribution of several Indian reservoirs [11].

The unscientific disposal of the wastewater has caused immense environmental problems not only to the aquatic environment but also to human beings worldwide. This problem started long back but intensified during the last few decades, and now the situation has become alarming in India [5].

The input of large quantities of nutrients mainly nitrates and phosphates in to river waters caused eutrophication and its related effects [7]. These nutrients particularly phosphorus is often the limiting nutrient in such systems [12].

Study area and sampling sites

The Nagzari dam is situated at Nagzari village of (Lat. 19^0-36'- 0" N and Long. 78^0- 16'- 0" E) Kinwat taluka, Nanded district of Maharashtra.



MAP OF THE STUDY AREA

It is one of the latest additions to the string of dam dotting the Satmala and Nirmal Ghats zone in Maharashtra. The dam is constructed on Nagzari river. Nagzari river is a tributary of Penganga river which is one of the major tributary of Godavari river. It flows entirely in the Nanded district. The dam is located at latitude 19^0-36'- 0" N and longitude 78^0- 16'- 0" E.

The location of the dam was shown in the map of the study area. The catchment area of dam is 33.23 sq. km. and area covered by the dam water is 215 hectares. The Nagzari medium project mainly constructed for irrigation and aquaculture. But few years before it is reserved for the drinking water supply to Kinwat city.

The water samples of Nagzari dam of Maharashtra were monitored for NO_2-N, and PO_4, contents fortnightly during July —2005 to June—2007, during the present study. Two sampling stations were regularly monitored for the study of nutrients. Sampling points of S-1and S-2were chosen in the dam.

MATERIALS AND METHODS

Water samples were collected in polythene containers from the dam at fortnightly intervals for a period of two years (1^{st} July 05 to 16^{th} June 07), taking few equipments and chemicals on the site as well as in the laboratory. Two sampling stations were regularly monitored for the study of nutrients (a lotic zone and another Lentic zone) water samples were collected and analyzed followed standard techniques and procedures [1].

RESULTS AND DISCUSSION

The investigated values observed on the fortnightly variation of nutrients at the selected two water sampling stations were presented in table – I. The concentration of nitrate was generally within the permissible limit at both sampling stations. The concentration of nitrate in the dam ranged from 0.19 to 0.87 mg/L. for the sampling site – 1 (S-1) and from 0.20 to 0.90 mg/L of the sampling site -2 (S-2).

The maximum values were observed in the Lentic zone of the dam represented by sampling station-2. In the present investigation lower nitrate values were recorded at both sampling stations. The high levels of nitrate in drinking water if ingested by infants less than six months old causes “infant cyanosis” or Methamoglobinaemia (Blue Baby Syndrome). Even though the nitrate, the major form of N_2 in oxidizing water is not a direct toxicant nevertheless and on its reduction to nitrate it becomes a health hazard.

Dams and reservoirs are relatively still and closed ecosystems in comparison to flowing system [9]. Lentic systems are strongly influenced by inputs of nutrients from the terrestrial watershed in which they lie. The watershed of Nagzari dam is covered by reserved forests, plantations and agricultural land and naturally, terrestrial input consisting of fallen leaves, dissolved and particulate organic matter brought down by surface runoff and flowing streams contributing substantially to the nutrient load of the dam. The most important source of nutrients in the Nagzari dam is the soil component. The water body of dam also receives biological components i.e. planktons and nektons through the surface runoff by rainfall. According to Fugueiredo, “The basin sediments in reservoirs serve as a major trap of nutrients” [18].

Nitrogen is a plant nutrient and stimulates crop growth. Natural soil nitrogen or added fertilizers are the usual sources, but nitrogen in the irrigation water has much the same effect as soil-applied fertilizer nitrogen and an excess will cause problems, just as too much fertilizer would.

Table I. Values of NO_2-N and PO_4 content (mg/L) observed Nagzari dam water near Kinwat during July 2005 to June 2007

Sr. No.	Date & Months	Nitrite - Nitrogen				Phosphate			
		July 2005 - June 2006		July 2006 - June 2007		July 2005 - June 2006		July 2006 - June 2007	
		S - 1	S - 2	S - 1	S - 2	S - 1	S - 2	S - 1	S - 2
1	1-Jul	3.6	3.9	2.8	3	0.43	0.45	0.4	0.42
2	16-Jul	3.9	4.2	3.4	3.6	0.59	0.62	0.39	0.4
3	1-Aug	4.3	4.6	3.2	3.4	0.19	0.2	0.34	0.36
4	16-Aug	4.1	4.4	3.5	3.8	0.25	0.28	0.33	0.34
5	1-Sep	4.6	4.9	2.2	2.3	0.79	0.82	0.73	0.76
6	16-Sep	6.3	6.6	2.6	2.9	0.65	0.66	0.69	0.72
7	1-Oct	7.5	7.8	3.1	3.3	0.41	0.44	0.81	0.84
8	16-Oct	4.3	4.6	2.9	3.1	0.29	0.3	0.87	0.9
9	1-Nov	4.1	4.4	3.1	3.4	0.41	0.42	0.75	0.78
10	16-Nov	3.6	3.8	4.4	4.7	0.59	0.62	0.61	0.64
11	1-Dec	4.2	4.4	3.9	4.1	0.53	0.56	0.53	0.56
12	16-Dec	4	4.2	4	4.3	0.73	0.76	0.51	0.54
13	1-Jan	3.7	3.9	4.1	4.4	0.46	0.48	0.45	0.48
14	16-Jan	3.4	3.6	3.7	4	0.35	0.36	0.43	0.46
15	1-Feb	3.1	3.2	3.1	3.3	0.21	0.22	0.32	0.34
16	16-Feb	2.8	2.9	3.2	3.4	0.27	0.28	0.29	0.3
17	1-Mar	2	2.1	2.9	3.1	0.36	0.38	0.27	0.28
18	16-Mar	1.4	1.5	2.8	2.9	0.33	0.36	0.21	0.22
19	1-Apr	1.6	1.7	2.5	2.6	0.25	0.26	0.19	0.2
20	16-Apr	1.2	1.3	2.6	2.8	0.29	0.3	0.21	0.22
21	1-May	0.8	0.9	2.1	2.2	0.3	0.32	0.24	0.26
22	16-May	0.9	1	1.4	1.5	0.27	0.28	0.26	0.28
23	1-Jun	1.6	1.7	2.5	2.6	0.29	0.3	0.28	0.3
24	16-Jun	1.8	1.9	2.8	3	0.26	0.28	0.35	0.38

If excessive quantities are present or applied, production of several commonly grown crops may be upset because of over-stimulation of growth, delayed maturity or poor quality. Sensitive crops may be affected by nitrogen concentrations above 5 mg/L. Most other crops are relatively unaffected until nitrogen exceeds 30 mg/L. The average concentration of NO_2 -N was low at the S-1 point compared to that of the S-2. These concentrations are below the acceptable and allowable limits (10 mg/L) of standards of India Standard Institute (ISI) and WHO.

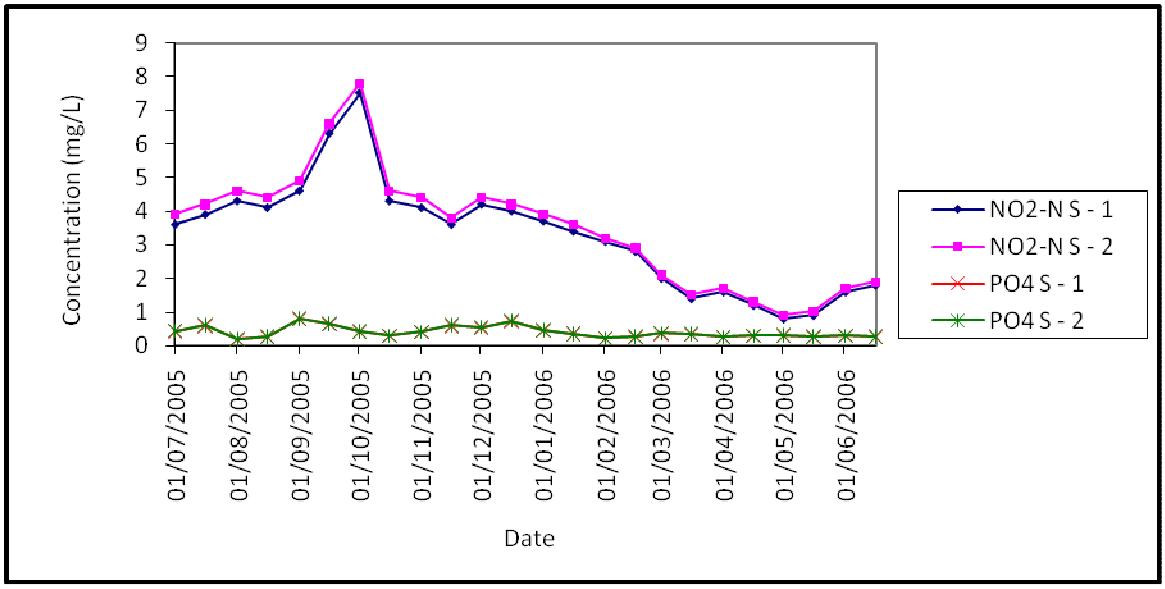


Figure 1: Values of NO_2-N and PO_4 observed (mg/L) at Nagzari dam of Maharashtra during July 2005-June 2006

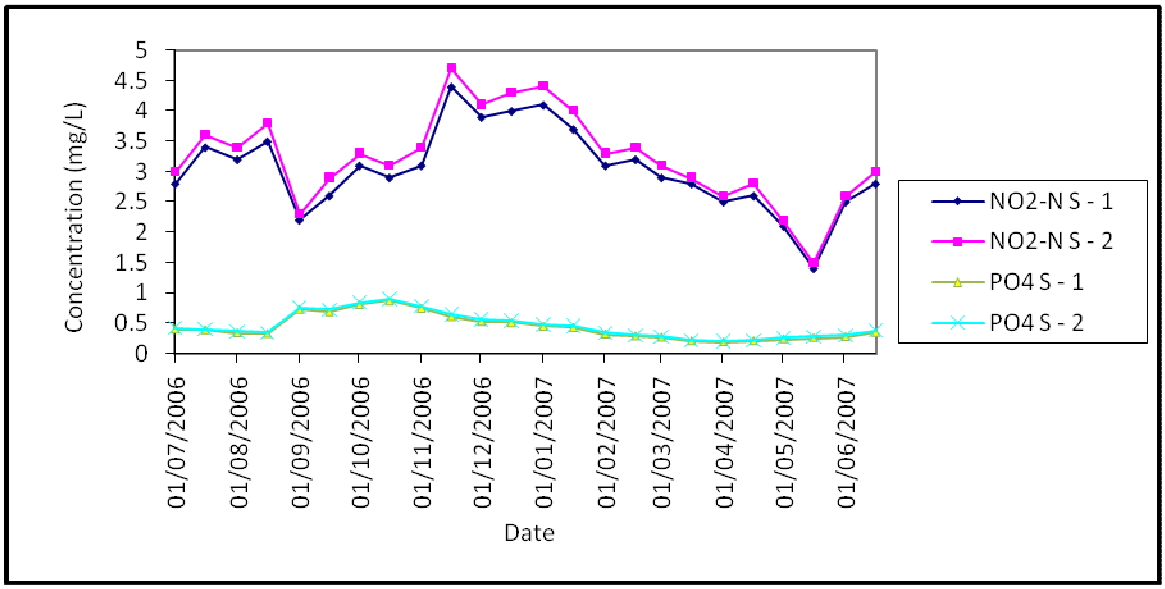


Figure 2: Values of NO_2-N and PO_4 observed (mg/L) at Nagzari dam of Maharashtra during July 2006-June 2007

The analyzed water of Godavari at Jayakwadi dam at Paithan of Maharashtra, the study during March to May 2005 the nitrate content varied from 18.2 to 55.3 mg/L from different water sampling stations, these higher concentrations were due to the organic matter in water [19]. The nitrate content was minimum as 0.08 mg/L and maximum 0.35 mg/L from Asramam pond during June 1999 to May 2000 [17].

The Mangrul dam water during November 2006 to October 2007 recorded the highest nitrate as 0.74 mg/L in November and lowest 0.17 mg/L in April from site - I and also recorded nitrate highest 0.89 mg/L in December and lowest in November 0.24 mg/L from site – II respectively [8].

The concentration of NO_3 6.5 to 15 mg/Lat US and 9.5 to 18 mg/L at DS during the year 2004 while 7.5 to 13.5 mg/L at US and 9.5 to 17.5 mg/Lat DS during the year 2005 in the Vashisti river water at Chiplun, Maharashtra [14].

The major sources of soluble PO_4, among others, were phosphate-containing detergents, contributing to half the PO_4 contained in domestic sewage [6]. Grazing and watering of livestock, frequently observed on the bank of the Nagzari river over the entire sampling period, could have also contributed to the high phosphate concentrations via urine and dung.

In the present investigation Phosphate concentration in the dam water ranged from 0.80 to 7.50 mg/L for the sampling station-1 and from 0.90 to 7.80 mg/L for the sampling station-2.

Amount of Phosphate content in the surface water is contributed by numerous routes. The phosphorous is a constituent of some dyes, surface active compounds and common detergents. Besides this atmospheric phosphorous, combustion of organic materials, industrial waste gases, fossil fuel burning and cremation fossil of human bodies [3]. The phosphates in low concentrations are not likely to causes any harm to man and animals. If the phosphate is consumed in excess, phosphene gas is produced in the gastrointestinal tract on reaction with gastric juice.

The major sources and information supply of phosphate in the dam water comes from agricultural areas and plantations in the watershed of the dam itself. The positive effect of rainfall on nutrients has been highlighted by several workers [16, 10, 13].

The phosphate concentration in the range of 0.08 to 0.28 mg/L and 0.05 to 0.24 mg/L in surface and sub-surface water of Bhadra river basin, the study was carried out in year 2005 [20].

The water pollution of Mula, Mutha and Pawana rivers in summer season at Pune during February-May 2006. They observed phosphate level and it was ranged from 0.096 to 4.35 mg/L. Phosphate determines the organic pollution due to domestic sewage [4].

The physicochemical parameters of Pakhal lake of Warangal, Andhra Pradesh the study was carried out during October 2004 to September 2005. The phosphate content fluctuated between the ranged of 0.24 to 1.34 mg/L. The obtained highest phosphate values in monsoon were due to the mixing of rainwater, with fertilizers from nearby agricultural fields [15].

CONCLUSION

The Nagzari dam in the rural region is relatively clean .The main source of pollution are human beings. The industrial pollution is negligible in this area. Rural areas are facing increased concentration of NO_2-N with intensified use of chemical fertilizers together with increased urbanization. The urban areas are experiencing continuously rise in phosphorus with the increased use of detergents.

It is concluded that NO_2-N and PO_4 showed significant variations in the water of the Nagzari dam. All the values were below the permissible limit prescribed by WHO. The present study was conducted on Nagzari dam to determine NO_2-N, and PO_4 profile over a period of two year .To summarize, the baseline results of present investigation clearly indicates that the Nagzari dam water confirms to safe for drinking, irrigation and for fishery.

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