Water quality assessment of Neri nala at Durgapur, Distt. Chandrapur of Maharashtra

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Abstract

The Neri nala is a small rivulet flowing between Chandrapur and Durgapur cities. Seasonal Studies were made to know the water quality of this small rivulet for assessing the water quality parameters viz. BOD, COD, TDS, Chloride, Sulphate, Phosphate along with other physico-chemical parameters. The additional burden to this small rivulet is received from washing, bathing and other domestic activities of adjoining slums. The studies indicate the polluted status of this rivulet due to inputs from adjoining localities and the degraded water quality, subsequently points out that it is unfit for bathing or any other activity. The presence of phosphate in large quantity originates due to surfactants utilized by local slum dwellers which might cause the eutrophication problem in long run.

Keywords: *Neri nala, Surfactant, Eutrophication*

Introduction

The Neri nala is a small rivulet which is situated about 2.5 km away from Chandrapur city. The slum area is situated on both the sides of this rivulet. The surrounding locality uses water for bathing, washing and other domestic purposes. The water after utilization is directly discharged into this rivulet which contain harmful detergents and domestic wastes. The study of water pollution of this rivulet has not been reported earlier, so keeping this in view, the present communication is an attempt to study the water quality. The samples were taken in month of March (summer) and August (monsoon) to study the physico-chemical variations during premonsoon and monsoon season. The present study deals with the assessment of different physico-chemical parameters like DO, BOD, COD, TDS, Chloride, Sulphate, Phosphate and other parameters of relevance. The assessment of these parameters is vital for knowing the water quality thoroughly.

Materials and Method

Water samples were collected from three sampling stations viz. station S_1, S_2 and S_3 once in a month of March and August for estimation of various physico-chemical parameters. Samples were collected and analysed according to APHA (1998). The samples were analysed within few hours of collection. The pH, Temp. and DO were measured on the spot. Determination of Chloride, Sulphate, Phosphate etc. were carried out by following standard methods in the laboratory.
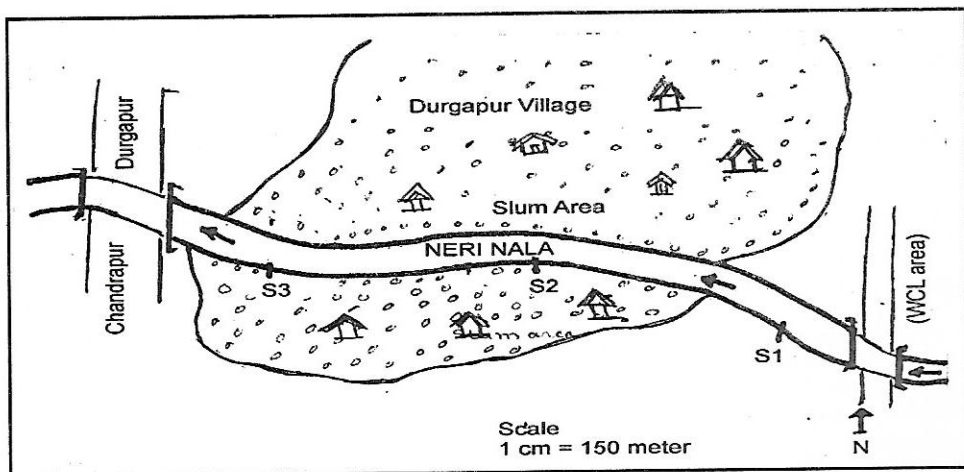
Fig. 1: Sampling station of Neri nala

Table 1.1: The parameters estimated and methods used are given in table

S.No.	Parameter	Method/ Equipment utilized
1	Temperature	Direct measurement on site by thermometer
2	pH	pH meter (Model- EQ- 610)
3	Conductivity	Conductivity meter (Model-EQ-660)
4	Alkalinity	Titrimetric method
5	DO	Modified Winkler's iodide- azide method
6	BOD	Modified Winkler's iodide (as per std. method)
7	CO_2	Titrimetric method
8	COD	Titrimetric method
9	TDS	Gravimetric method
10	Chlorides	Argentometric method
11	Sulphate	Spectrophoto meter (EQ- 820)
12	Phosphate	Spectrophoto meter (EQ- 820)

Results and Discussion

Variations of physico-chemical characteristics during March and August months are given in Table 1.2. The waters were discharged in the Neri nala from surrounding village Durgapur. The chemical analysis of the nala water showed that it is rich in organics as reflected by high BOD & COD values. Temperature is basically important for its effects on a certain chemical and biological activities. In present study maximum temperature was recorded 32.22 ºC in month of March at site S_3 and minimum temperature recorded 28.00 ºC in month of August at site S_2. The temperature showed an inverse relationship with the dissolved oxygen, which is consistent with result reported by Das and Shrivastava, 1956 and Khanna , 1997. pH is the scale of intensity of acidity and alkalinity of water and measures the concentration of hydrogen ions. Maximum pH values recorded in month of August was 7.62 at site S_2 and minimum pH value recorded in

Table 1.2: Physico-chemical Parameters of Neri nala in summer and monsoon month (March 2006 and August 2006)

S.No.	Parameter	March			Mean	August			Mean
		S_1	S_2	S_3		S_1	S_2	S_3	
1	Temp. (^{0}C)	32.1	32.17	32.22	32.16	28.5	28.0	28.02	28.17
2	pH	7.02	7.06	7.12	7.06	7.3	7.62	7.46	7.46
3	Alkalinity (mg/l)	89.0	96.0	102.0	95.66	42.9	45.77	46.96	45.21
4	Conductivity	530.0	580.0	610.0	573.33	410	422.0	489.0	437.0
5	DO (mg/l)	3.8	4.1	4.6	4.16	5.8	6.7	7.1	6.35
6	BOD (mg/l)	12.24	13.05	13.89	13.6	15.6	17.2	17.89	16.71
7	CO_2 (mg/l)	8.02	9.11	12.1	9.74	5.21	6.29	7.62	6.37
8	COD (mg/l)	10.9	11.18	11.89	11.32	8.2	9.67	10.2	9.29
9	TDS (mg/l)	290.0	379.0	420.0	363.0	490	580.0	632.0	567.33
10	Chlorides (mg/l)	21.22	22.89	24.22	22.72	34.0	35.5	36.2	35.23
11	Sulphate (mg/l)	3.2	3.6	3.7	3.5	2.0	2.29	2.4	2.48
12	Phosphate (mg/l)	5.0	5.2	5.8	5.4	3.2	3.7	3.85	3.58

month of March was 7.02 at site S_1. Identical results were reported by Sangu and Sharma, 1985 and Prapurna and Shashikanth, 2002. The high pH in rainy season is due to dissolved organic substances from the catchment area. During the study, the highest concentration was observed in month of March at site S_3 102.00 mg/l and lowest concentration was observed in month of August 42.90 mg/l at site S_1. Alkalinity was mainly due to bicarbonates throughout the year, similar observations have also been reported by Holden and Green, 1960 and Venkateshwarlu and Jayanti, 1968.

On the basis of the data obtained from the water sampling, conductivity range in month of March was 573.33 μmhos/cm^2 and in month of August was 437 μmhos/cm^2. The dissolved oxygen and free carbon dioxide are usually inversely related to one another because of the photosynthetic and respiratory activities of the biota (Hynes, 1970). Dissolved oxygen is one of the important parameter in water quality assessment. The DO was found to be maximum 7.1 mg/l in month of August at site S_3 and minimum 3.8 mg/l in month of March at site S_1. The high temperature and low dissolved oxygen during summer, was also reported by Badola & Singh (1981) in the river Alaknanda.

The free carbondioxide is released during the decomposition of certain substances and metabolic activities of living organism, since high temperature accelerate the decomposition of organic substances as well as respiratory activity of the biota. The carbondioxide maximum value recorded in month of March was 12.1 mg/l at site S_3 and minimum value recorded in month of August at site S_1 was 5.21 mg/l. This phenomenon was also reported by Quadri and Shah, 1984. BOD determination is a most useful technique to assess the level of organic pollution in water. The maximum BOD was observed 17.89 mg/l at site S_3 in month of August and minimum 12.24 mg/l in the month of March at site S_1, the same trend was reported by Raina *et al.*, 1984. Chemical oxygen demand is the amount of oxygen required to oxidize all the organic material. It was noted maximum in month of March i.e. 11.89 mg/l at site S_3 and minimum 8.20 mg/l in month of August at site S_1. Total Dissolved solids cause ecological imbalance in the aquatic ecosystem by mechanical abrasive action. In present study, it was noted that TDS was maximum 632.00 mg/l in month of August at site S_3 and minimum 290.00 mg/l in month of March at site S_1. Similar condition was also reported by Verma

and Shukla, 1969; Zingde *et al.*, 1980. Chloride is one of the important chemical indicator of pollution in present study. The maximum value 36. 22 mg/l noted in month of August at site S_3 and minimum value 21.22 mg/l in month of March at site S_1. The similar result was also reported by Raina *et al.*, 1984.

The major sources of phosphates are domestic sewage, agricultural run off and detergents and phosphate are normal constituent of human excreta. Phosphates in large quantity indicates pollution through sewage. In the present study maximum phosphate concentration is 5.8 mg/l in month of March at site S_3 & minimum concentration recorded 3.20 mg/l in month of August at site S_1 which is due to dilution by rain. Sulphate is an important component in protein metabolism and plays important role in growth of plants. Maximum sulphate concentration recorded in present study is 3.7 mg/l in month of March at site S_3 & minimum sulphate concentration recorded 2.00 mg/l in month of August at site S_1, which is due to dilution.

In the present study values of physico-chemical parameters BOD & COD show excess values. Also phosphate and sulphate are noted to be high and it indicates that water is polluted. Pollution of water due to various agencies is one of the important cause to increase a number of blue green algae. These conditions promote eutrophication of water at a rapid rate due to which water is unsuitable for drinking, washing and bathing purpose (Wilhm and Dorris, 1968). From the present study it is noted that there is a definite impact on the water quality of Neri nala due to adjoining slums and their household discharges. Also there is a dilution effect due to rain in monsoon.

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