IOSR Journal of Applied Chemistry (IOSR-JAC)
e-ISSN: 2278-5736.Volume 9, Issue 11 Ver. III (November. 2016), PP 60-64
www.iosrjournals.org

‘‘Physico-Chemical Characterization of Narmada River Water to Assess Pollution Level”

Smt. Sulochana Patil[1], Dr. Pushpendra Sharma[2]
(1) Asst. Prof. of Chemistry, Govt. P.G. College, Dhar M. P.
(2)Professor of Chemistry, SSSUTMS, Sehore M. P.

Abstract: *India has a network of rivers and blessed with snow cover in the Himalayan range that gives perennial rivers. However, with the rapid increase in the pollution of the rivers and the need to meet the increasing demand of irrigation, human and industrial consumption, the available water resources are getting depleted and the water quality has deteriorated. Indian rivers are polluted due to discharge of untreated sewage and industrial effluents. River Narmada is one of the 13 prominent rivers of India which covers 98,797sq km of total water shed area. Narmada is the lifeline and west flowing river of the states of Madhya Pradesh and Gujarat.*

I. Introduction

India has a network of rivers and blessed with snow cover in the Himalayan range that gives perennial rivers. However, with the rapid increase in the pollution of the rivers and the need to meet the increasing demand of irrigation, human and industrial consumption, the available water resources are getting depleted and the water quality has deteriorated. Indian rivers are polluted due to discharge of untreated sewage and industrial effluents. River Narmada is one of the 13 prominent rivers of India which covers 98,797sq km of total water shed area. Narmada is the lifeline and west flowing river of the states of Madhya Pradesh and Gujarat. Only small amount of water that occurs in fresh water rivers, streams, lakes and tanks is available for the terrestrial life (Wetzel 1975). Rivers and streams have become the dump yards of domestic sewage and industrial effluents. Alarming increase in human population and unethical urbanization has lead to the pollution of fresh water bodies to a great extent. Rivers are the major sources of drinking water, besides their usage in agriculture, washing, bathing etc. Pollution of these may invite unhygienic conditions and water born infectious diseases not only for humans but also for the biota depending and living in it. Among rivers, Narmada is considered one among the important rivers of the country and is the largest west-flowing river in India. It flows 1300 km west through the states of Madhya Pradesh and Gujarat before draining into the Gulf of Khambhat in the Arabian Sea. It is said to be one of the most beautiful rivers in India. In terms of its catchment area it is the seventh largest among the fourteen major river basins in the country. With many short tributaries flowing into it from north and south, the Narmada basin forms a very important topographic feature of peninsular India.

India is blessed with good rainfall and water resources. There are eighteen major river basins and they account for 84% of the total drainage area. The demand for water by various user sector and one hand is increasing day by day while on the other the abuse and misuse is increasing manifold. Several aspects of hydrobiology and pollution of Indian rivers have been investigated by various authors like Ganapathi and Chacko (1951) on Gadavari, David (1956) on Bhadra: Chakraborty -et.a1. (1959) on Jamunat Laksminarayana (1965) on Ganga; Rai (1974)on Yamuna; Olaniya -et.al. (1976) on Gometi; Ram Rao et.al.(1977) on Khan; Sampathkumar (1977) on Moosi; Sharma (1979) on Bhagirathi; Govindan and Sundearesan (1979) on Adiyar ; Prasad and Manjula (1980) on Gomati; Sharma G.G. et al. (1981) on Yamuna; Paramasivam and Sreenivasan (1981) on Cauvery ; Sornashekar (1981) on Cauvery and Kapila ; Venkateswarlu and Sheshadri (1981) on Krishna; Mitra (1982) on Godavari; Kribhne and Tungabbadra; Braj Nandan Prarad and Singh (1982) on Gomati; Ghanvat (1983) on Krishna; Rajkulaar (1984) on Manjira; Bhatt –et. al . (1985) on Koshi; Bhowmick – et. al .(1985) on Ganga; Ajmal and Khan (1985) on Kalinadi; Dora Roy (1988) on Subernarekha; Shukla - et. al . (1989) on Ganga; Manikya Reddy - et. al. (1991) on Tungabhadra and Singh and Singh (1994) on Ganga. Sastry et.al. (1972) and Dubey (1980) had a survey of river pollution.

In our country about 22 million hectare meters of ground water is required for industrial purpose, steel, oil refineries. About 56 million hectare meters of groundwater is used for irrigation and agriculture purpose. The average annual surface water resources of the country have been placed at a total of about 170 million hectare meters. Approximately 70 per cent of the fresh water used by human beings goes to agriculture. Fertilizers and biocides both affect the plant and animals adversely, if they are present in an excess amount. Phosphate and nitrate fertilizers are responsible for the degradation of water quality and make it unfit for human consumption. Pesticide poisoning is reported to cause hyper sensitivity muscular disorders, respiratory troubles, convulsion

nausea and vomiting and diarrhea in human beings. Bio-accumulation of radio isotopes (Cs137 and Sr90) in muscles and bones damage the tissues and accumulation of radioactive iodine in the thyroid glands is known to disrupt its functioning.

The entry of pollutants into flowing river sets off a progressive series of physical, chemical and biological events with downstream water. The character and quantity of the polluting substances thus govern the nature of the water quality. At the downstream point of industrial area, water quality becomes useless to the extent that it is unfit for drinking and often acts as a disease carrier. The water pollutants are mainly the chemicals used in agriculture.

Narmada is the fifth largest river of India. It is commonly known as the Life line of Madhya Pradesh. The major part of Narmada river (88%) flows in this state. It originates from Amarkantak of eastern MP and it flows towards West and joins Arabian sea at Bharuch in Gujarat. The present study was conducted at Khalghat Dist. Dhar M.P.

II. Materials & Methods

The sample site selected was near Khalghat, Dist.-Dhar M.P. The Narmada River water samples were collected in 2 litre polythene jerry canes for physico-chemical studies. All parameters except temperature, pH, color and odour were recorded at sampling station. For dissolved oxygen samples were collected in 300 ml dissolved oxygen bottles and their dissolved oxygen was fixed on spot. The chemicals used were of A.R. or its equivalent grade and distilled water was used for all preparations. Samples for the determination of B.O.D. were collected in B.O.D. bottles by siphoning to avoid aeration. Physico-chemical studies were made by following procedures laid down in "Standard Methods for examination of water and waste water." [1].

III. Experimental

The samples for our study were collected from river, during the year 2014. Samples were collected manually at regular intervals usually the first week of every month. All the parameters were analyzed in our laboratory except temperature, colour, odour and pH, which were recorded at the sampling sight.

All the observations are presented in the table 1.

Table 1:- Physico-Chemical Characteristics of Narmada River water during year 2014.

	MONTH											
Parameters	**Jan**	**Feb.**	**Mar.**	**April**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**
Temp.	**19**	20	25	26	28	**32**	28	27	25	23	22	21
pH.	**7.5**	7.7	8.1	8.1	8.1	**8.4**	8.3	8.3	8.2	8.1	8	7.9
Colour	Colrls	Colrls	Colrls	Colrls	Colrls	Colrls	Brown.	Brown.	Brown.	Colrls	Colrls	Colrls
Odour	Odls.	Odls.	Odls.	Odls.	Odls.	Odls.	Odls.	Odls.	Odls.	Odls.	Odls.	Odls.
Alkalinity	116	123	125	163	174	**176**	77	66	**57**	85	97	114
Ca hard.	31	27	32	36	**57**	46	**18**	24	26	25	30	31
Mg hard.	**22**	21	23	22	23	22	15	**10**	15	13	17	21
Total hard.	53	48	55	58	**80**	68	**33**	34	41	38	47	52
T.D.S.	265	273	286	310	460	**470**	211	251	267	**130**	240	262
S.S.	132	126	137	137	150	**147**	121	132	141	**86**	121	126
Total solid	397	399	423	347	610	**617**	332	383	408	**216**	361	388
D.O.	8	8	7.8	6.9	6.6	**6.3**	7.5	7.4	7.5	8.1	**8.2**	7.9
B.O.D	8	9	10	11	13	**15**	10	7	8	**6**	8	8
C.O.D	14	15	20	24	26	**32**	27	18	15	**10**	13	16
Chloride	18	25	42	28	33	**42**	**14**	19	20	23	30	24
Sulphate	26	37	34	35	44	**50**	**14**	19	22	23	23	25
P asP2O5	**2.02**	1.17	1.25	1.22	1.38	1.47	1.09	1.07	**0.96**	0.99	1	1.9
T.K.N.	1	1.1	1.2	2	2.2	**2.3**	1.9	0.3	**0.2**	0.3	0.5	0.9
Na	40	36	29	30	40	**42**	19	20	**14**	26	36	41
K	48	44	32	34	52	**56**	31	30	**24**	36	42	4

Colrls = Colourless, Odls = Odourless

IV. Results And Discussion

The colour of river water indicates no pollution. The colour of river water changed during the rainy season due to colloidal soil particles. The water was odourless during the year 2014. The pH of river water was found between 7.5 to 8.4 during the year 2014.

Alkalinities of the river water were found between 57 to 176 mg/l during the year 2014. The highest value was recorded in June 2014 and the lowest alkalinity was recorded in September 2014. Alkalinity increases during the year 2014. Ca hardness varied between 18 to 57 mg/l during the year 2014. Mg hardness were recorded in the range of 10 to 22 mg/l during the year 2014.

T.D.S. of river water ranged 130 to 470 mg/l. Suspended solids were found in the range of 86 to 147 mg/l during the year 2014. Dissolved oxygen of river water varies with temperature. D.O. was found in the range of 6.3 to 8.2 mg/l during the study period. D.O. values were lower in hot months and higher in cold months. B.O.D. of river water ranged between 6 to 15 mg/l throughout the study period. C.O.D. was recorded in the range 10 to 32 mg/l during the year 2014. Lowest value of C.O.D. was observed in October and highest value in June.

The chloride, sulphate, P2O5, TKN, Na and K were within normal range. Thus the river water is not polluted at the sampling site.. The over all parameter values indicate no pollution at this site. Thus the water quality is good.

References

[1]. APHA, AWWA:- "Standard methods for the examination of water and waste water (20 th Edition)", American Public Health Association, New Yark (1995).
[2]. W.H.O. :- "Guidelines for Drinking Water Quality. 2 nd Edition" (1996)
[3]. Bela:- "Environmental Engineering, Hand Book Vol. I Water Pollution", Chitton Book Company, Radm, Pensylvania (1965).
[4]. Kannan,K.:- "Fundamentals of Environment Pollution," S. Chand & Co. , New Delhi ,(1991)
[5]. W.H.O. :- "Guidelines for Drinking Water Quality. 2 nd Edition" (1996)
[6]. Ramaswami, S.and Sridharan, S. :- "Physico-chemical Characteristics of surface and ground water in Tannery belt of Vaniyambadi and Amber North Arct. District, Tamilnadu", Poll. Res. 17 (2),114-117 (1998)
[7]. Kulshrestha, S., Dhinsa, S.S. and Singh, R.V. :-"Physicochemical characteristics of underground water and effluent water in Sanganer town of Jaipur city during premansoon season". Nat. Environ. Poll. Tech. 1 (4) 453, (2002)

Fig.1:- Variation of Temperature and pH

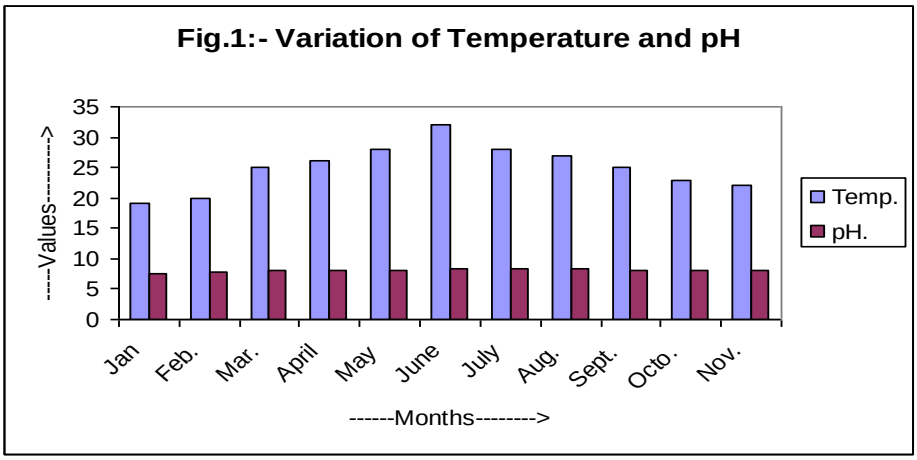


Fig.2:- Variation of Alkalinity, Ca and Mg hardness.

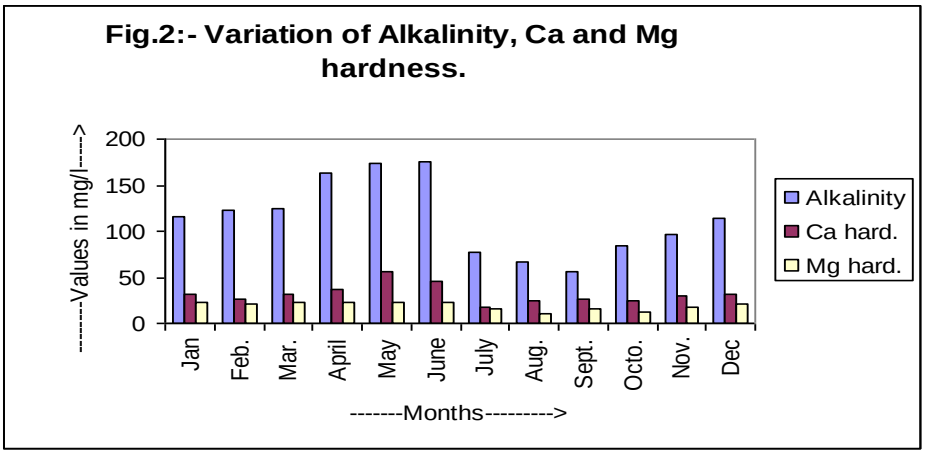
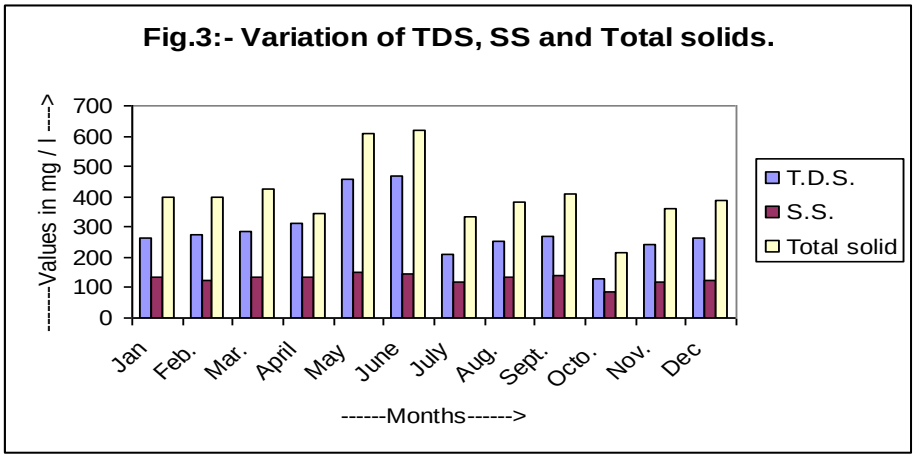


Fig.3:- Variation of TDS, SS and Total solids.



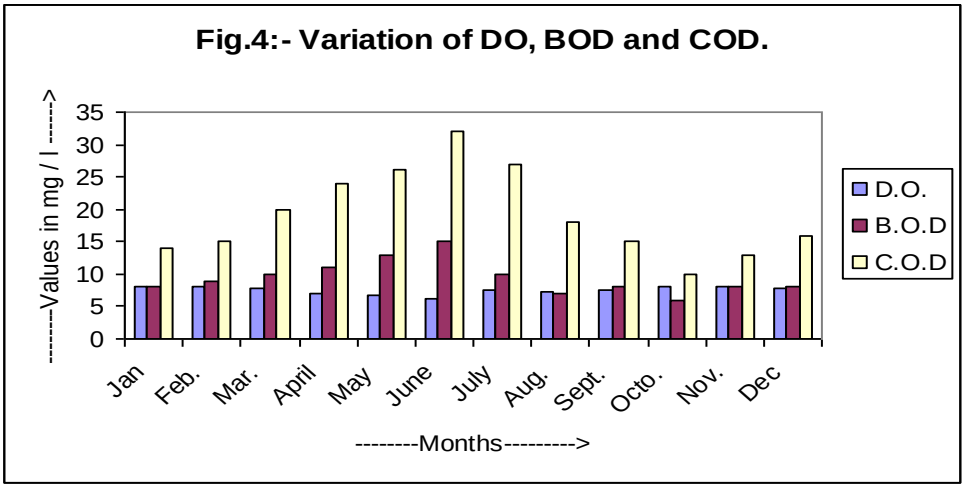


Fig.4:- Variation of DO, BOD and COD.
------Values in mg / l ------>
35
30
25
20
15
10
5
0
Jan
Feb.
Mar.
April
May
June
July
Aug.
Sept.
Octo.
Nov.
Dec
--------Months--------->
D.O.
B.O.D
C.O.D

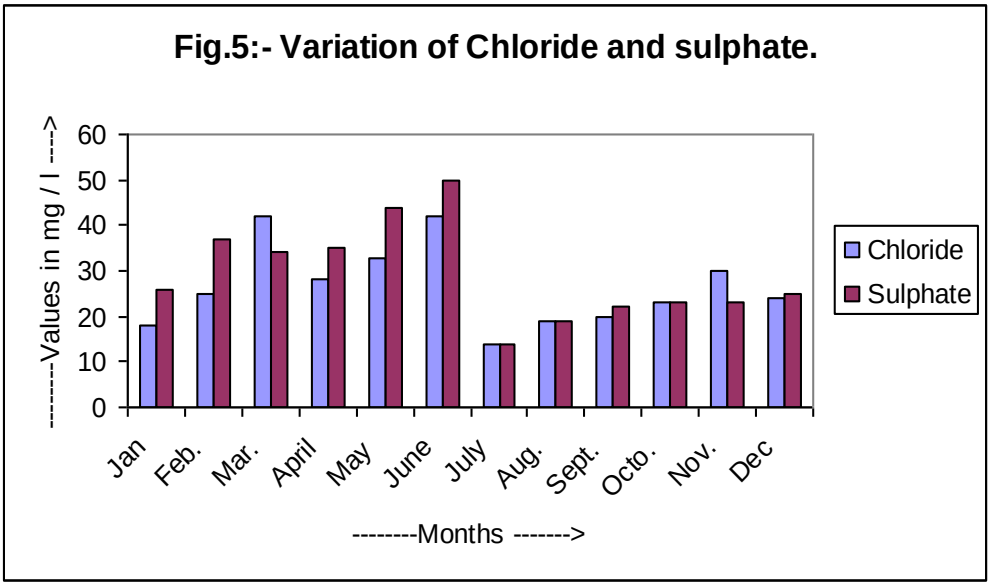


Fig.5:- Variation of Chloride and sulphate.
------Values in mg / l ---->
60
50
40
30
20
10
0
Jan
Feb.
Mar.
April
May
June
July
Aug.
Sept.
Octo.
Nov.
Dec
--------Months ------->
Chloride
Sulphate

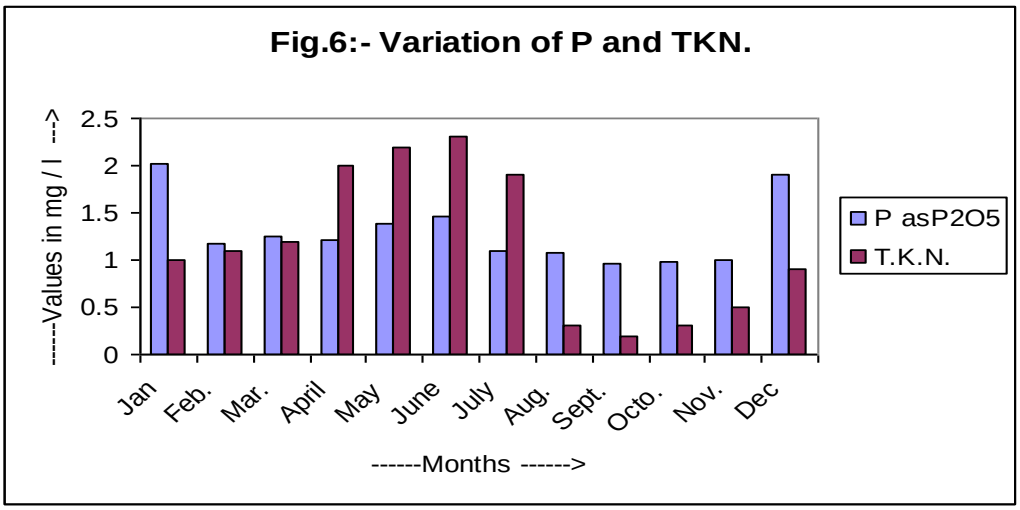


Fig.6:- Variation of P and TKN.
-----Values in mg / l --->
2.5
2
1.5
1
0.5
0
Jan
Feb.
Mar.
April
May
June
July
Aug.
Sept.
Octo.
Nov.
Dec
------Months ------>
P asP2O5
T.K.N.

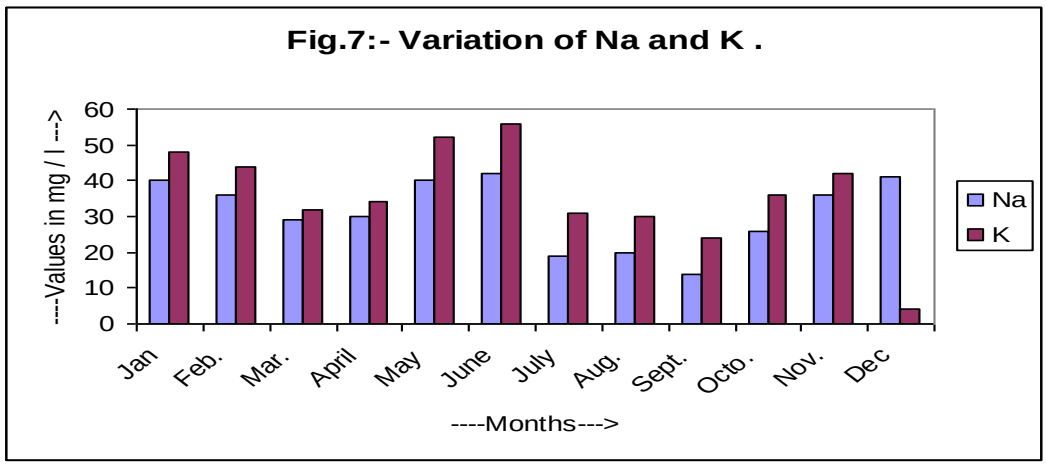


Fig.7:- Variation of Na and K .
----Values in mg / l --->
60
50
40
30
20
10
0
Jan
Feb.
Mar.
April
May
June
July
Aug.
Sept.
Octo.
Nov.
Dec
----Months--->
Na
K