International Journal of Scientific Engineering and Applied Science (IJSEAS) – Volume-2, Issue-8, August 2016
ISSN: 2395-3470
www.ijseas.com

ANALYSIS OF WATER QUALITY USING PHYSICO-CHEMICAL PARAMETERS FROM VARIOUS DAMS OF AMARAVATI DISTRICT, MAHARASHTRA, INDIA

Umesh Chaudhari[1*], Sunil Kondulkar[2], Atul Wanjari[1], Nitin Wanjari[1]
E-mail: atulrdik@gmail.com

1. Department of Chemistry, Mahatma Fule College, Warud, Amravati University, India
2. Department of Chemistry, Mahatma Fule College, Warud, Amravati University, India

Abstract:

This Paper Present to study of the Physico-chemical Parameters of dam water in Amravati district of Maharashtra state. The range of Physico-Chemical Parameters Such as Water Turbidity (0.33 - 0.79 NTU), TDS (352 – 523 mg/l), pH (6.7 – 7.4), DO (3.10 – 2.40 ppm), Total Hardness (123.7 – 400.4 ppm), Chlorides (4.32 – 11.45 ppm), Alkalinity (175 – 289 ppm), Ca^{2+} (111.1 – 145.7 ppm), Mg^{2+} (57.12 – 64.47 ppm), PO_4^{3-} (0.03 – 0.56 ppm) and SO_4^{2-} (0.17 – 0.51 ppm) were found to be in different dam water. All Parameters were within the Permissible limits. The results indicate that the dam water is Non-polluted and can be used for Domestic, Irrigation and agriculture. The results are compared with standards of World Health Organisation **(WHO)**, United States Public Drinking water Standard **(USPH)** and Indian Council of Medical Research **(ICMR)**.

Keywords: Physico-chemical analysis, Dam water, Amravati district.

1. Introduction:

Water is one of the most important and abundant compounds of the ecosystem. Physico chemical parameter study is very important to get exact idea about the quality of water and we can compare results of different physico-chemical parameter values with standard values. It is very essential and important to test the water before it is used for drinking, domestic, agricultural or industrial purpose [1]. Ground water contributes 0.6% of the total water resources on the earth is the major source of drinking and agriculture water in rural and urban areas [2]. The quality of ground water depends on various chemical constituents and their concentration. It is very essential and important to test the water before it is used for drinking, domestic, agricultural or industrial purpose. Water must be tested with different physic-chemical parameters. Selection of parameters for testing of water is solely depends upon for what purpose we going to use that water and what extent we need its quality and purity [3-5]. Water does content different types of floating, dissolved, suspended and microbiological as well as bacteriological impurities. Some physical test should be performed for testing of its physical appearance such as temperature, color, odour, pH, turbidity, TDS etc, while chemical tests should be perform for its BOD, COD, dissolved oxygen, alkalinity, hardness and other characters [6-8].

1.1. Study Area-

Warud is a tahsil place of Amravati district (Maharashtra State) surrounded by satpuda hills. This area is well known for Paneri which is most economical source of this area. The crop of paneri is mainly exported to Rajasthan, Madhya Pradesh, Tamilnadu and other parts of India. Farmers of this area also have a variety of fruits crops like oranges, Cotton and Turmeric. Economical source of the peoples in this region is mainly depends upon the crops of Paneri, orange, cotton, turmeric and to increase the yield of crop water analysis must be carried out. Study area were selected as Nagthana Dam, Shekhdari dam, Satnur dam, Pusli dam shown by satellite images and indicated in Table No.-I. All the

sources are providing their water for drinking purpose, agriculture, irrigation, small orange mandies for fruit processing.

Table 1: Sample points indicated as

Sr. No	Sample Point	Denoted As	District
1	Nagthana Dam	NW-I	Amravati
2	Shekhdari Dam	NW-II	Amravati
3	Satnur dam	NW-III	Amravati
4	Pusli dam	NW-IV	Amravati

Fig. 1 Satellite View of Pusli Dam

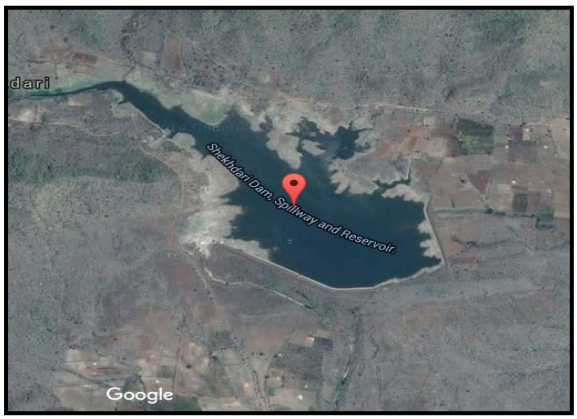


Fig. 2 Satellite View of Shekhdari Dam

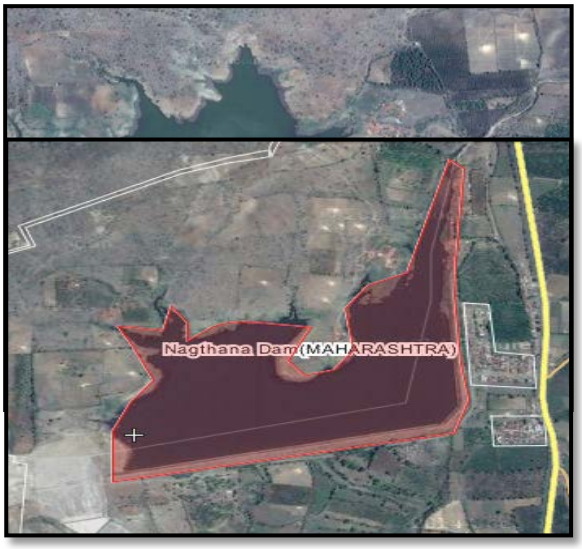


Fig. 4 Satellite View of Nagthana Dam

Material And Methods

The entire samples were collected in the first week of January 2015. First sample were collected from Nagthana Dam, Second Sample were collected from Shekhdari Dam, Third Sample collected from Satnur dam and fourth sample were collected form Pusli dam. The samples from reservoir sites will be collected from four corners of the damp, intake structure in case water is pumped. When there is no discharge in canal, sample will be collected from the upstream side of the regular structure. These samples were collected from approximately 15-20 cm below the water surface. Care must be taken not to catch any floating material or bed material into the container. The standard procedures were adopted for the determination of physico-chemical parameters. All the chemicals used were AR grade of pure quality. Double distilled water was used for the preparation of all the reagents and solutions. Glasswares were cleaned with commercial HCl followed by distilled water.

Fig. 3 Satellite View of Satnoor Dam

Table 2: Methods used for estimation of various parameters

Sr. No	Parameters	Method
1	pH	pH Metrically
2	Electrical Conductance (µS)	Conductometrically
3	Alkalinity (ppm)	Titration Method
4	Calcium	Titration Method
5	Magnesium	EDTA Titration Method
6	Chloride (ppm)	Precipitation Titration
7	Silica (ppm)	Spectrophotometricaly
8	Phosphate (ppm)	Spectrophotometricaly
9	TDS	Gravimetrically
10	COD	Titration Method
11	DO	Winkler Method
12	Hardness	Titration Method
13	Turbidity (NTU)	Turbidity Meter
14	Sulphate	Spectrophotometricaly

RESULTS AND DISCUSSIONS

Sr. No	Parameters	NW-I	NW-II	NW-III	NW-IV	WHO	USPH	ICMR
1	pH	6.7	6.9	7.4	6.5	6.5-9.2	6.0-8.5	6.5-8.5

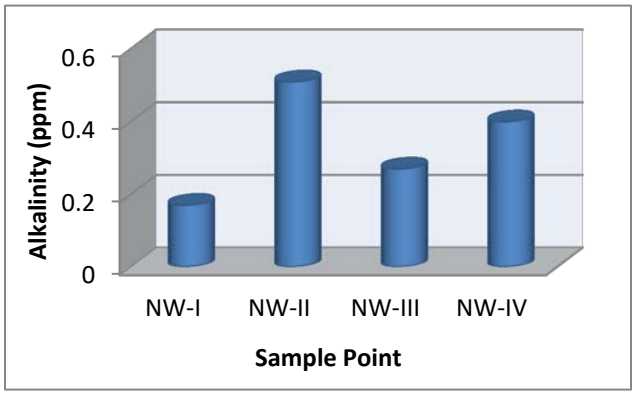
Table 3: Analytical data of water samples

2	EC (µS)	1.81×10^{-3}	1.80×10^{-3}	1.93×10^{-3}	1.84×10^{-3}	300	300	300
3	Alkalinity (ppm)	175	156	265	289	----	----	----
4	Ca^{2+} (ppm)	134.2	122.7	145.7	111.1	75	100	75
5	Mg^{2+} (ppm)	67.11	64.47	57.12	57.57	50	30	50
6	Cl^{-} (ppm)	7.126	4.323	7.677	11.45	200	250	250
7	Silica (ppm)	23.16	42.61	69.76	51.21	----	----	----
8	PO_4^{3-} (ppm)	0.056	0.089	0.034	0.568	----	----	----
9	TDS (mg/l)	503	523	411	352	500	500	500-1500
10	COD (ppm)	116	154	213	189	----	----	----
11	DO (ppm)	2.40	2.40	3.10	3.20	----	----	----
12	Hardness (ppm)	123.7	151.82	400.4	235.4	300	500	300
13	Turbidity (NTU)	0.77	0.63	0.33	0.79	5	----	---
14	SO_4^{2-}	0.17	0.51	0.27	0.40	----	----	----

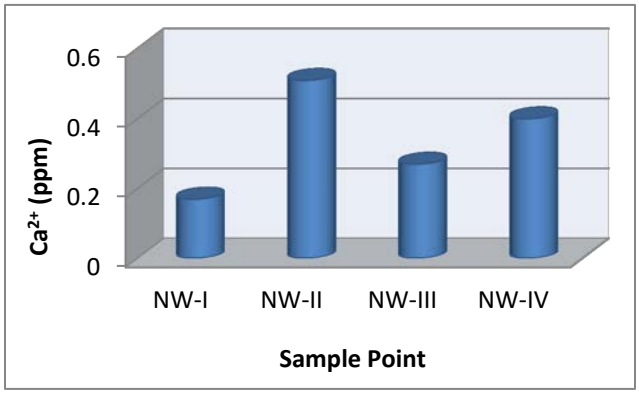
pH:- The pH of NW-III sample water sample was found to be 7.4 which is higher than other dam water. pH is most important in determining the corrosive nature of water. Lower the pH value higher is the corrosive nature of water.

Conductance: - Conductivity shows significant correlation with ten parameters such as pH value, chemical oxygen demand, alkalinity, total hardness, temperature, calcium, total solids, total dissolved solids, and chloride and iron concentration of water [9]. In the present study conductivity was found to be somewhat constant to all dam water.

Alkalinity: - Alkalinity is composed primarily of carbonate (CO_3^{2-}) and bicarbonate; it acts as a stabilizer for pH. Alkalinity, pH and hardness affect the toxicity of many substances in the water. It is determined by simple dil HCl titration in presence of phenolphthalein and methyl orange indicators. In the present study alkalinity of NW-IV water was found to be 300 mg/l.



Calcium: - Calcium is measured by complexometric titration with standard solution of ETDA using Patton's and Reeder's indicator under the pH conditions of more than 12.0. The water above Calcium values 25 mg/l are classified as 'Calcium rich'. The present investigation shows that the concentration of calcium of the NW-III water is 145.7 ppm. NW-III water contains high concentration of calcium than other dam water. The values of calcium are found to be in the permissible range of WHO, UPSH, ICMR.

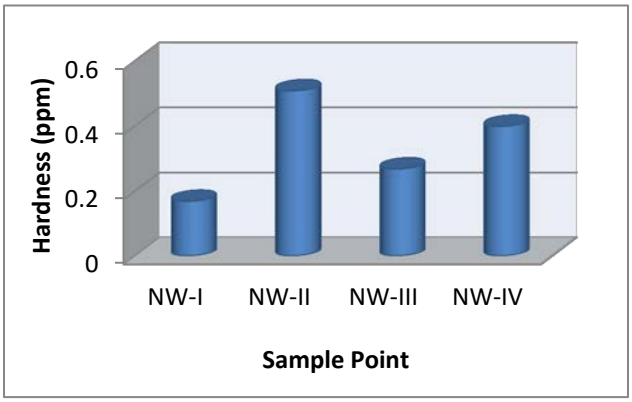


Magnesium: - Magnesium is found in seawater (about 1300 ppm) and oceans (after the sodium) in big quantity. Rivers contains approximately 4 ppm of magnesium. Magnesium and other alkali earth metals are responsible for water hardness. The observed value of Magnesium of NW-I was found to be 67.11 ppm. It is higher than other dam water. It exceeded the norm of WHO (50 ppm), UPSH (30 ppm), ICMR (50 ppm) may be due to agricultural activities.

Chloride:-The suitability of water resource for the irrigational use in agricultural is depends on its salt concentrations, especially Chloride contents. In the present investigation Chloride concentration of NW-IV was found to be 11.45 ppm. Chloride value is much higher than other dam water.

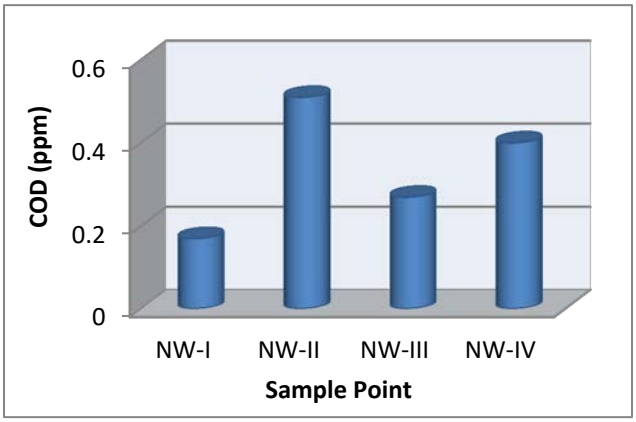
Total hardness: - Total hardness of water is caused by the presence of Calcium and, Magnesium salts. Hardness has no known adverse effect on health. However, maximum permissible level has been prescribed for drinking water is 300mg/l, by WHO. According some classifications water having Hardness up to 75 mg/l is classified as soft, 76 to 150 mg/l is moderately soft, 151-300 mg/l as hard and more 300 mg/l as very hard. In the present investigation Hardness of NW-III was found to

be 400.4 ppm. This is higher than other dam water.



DO: - DO correlation with water body gives direct and indirect information e.g. bacterial activity, photosynthesis, availability of nutrients, stratification etc. [10]. The presence of DO gives taste of drinking water. The DO value also indicates the degree of pollution in water bodies [11]. In the present investigation higher value of dissolve oxygen was found in NW-IV water which is 3.2 ppm and higher than other dam water.

COD: - Both BOD and COD are key indicators of the environmental health of a surface water supply. The maximum value of COD was found in NW-III which is 213 ppm and higher than other dam water. It exceeded the norm of WHO (50 ppm) may be due to agricultural activities.



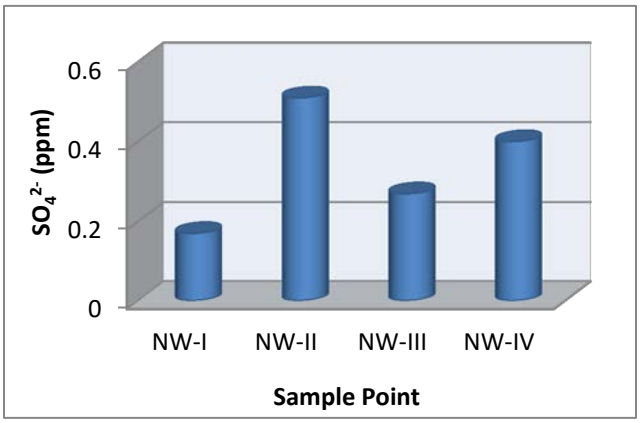
Turbidity: - Turbidity is a measure of the degree to which the water loses its transparency due to the presence of suspended particulates. It is essential to eliminate the turbidity of water in order to effectively disinfect it for drinking purposes. In the present investigation higher value of turbidity was found in the NW-IV which is 0.79 NTU. This value is higher than any other dam water.

Silica: - All natural water supplies contain some dissolved "silica" and most will also contain suspended or colloidal silica. In solution it can exist as silicate ion, depending upon the pH. Silica (SiO_2) is an oxide of silicon, and is present in almost all minerals: It is found in surface and well water in the range of 1 - 100 mg/L. In the present investigation higher value of silica was found to be 69.76 in the NW-III which is higher than other dam water.

Phosphate: - The typical phosphate levels found in a liter of drinking water are about one hundred times lower than the phosphate levels found in the average American diet. For example, a person would have to drink 10 to 15 liters of water to equal the amount of phosphates in just one can of soda. Phosphate value was found to be 0.568 ppm in the NW-IV which is higher than other dam water. Mining redistributes phosphate, metals, salts, lead, and radiological material formerly bound in the phosphate ore. In higher concentrations and released into the environment, these become poison and degrade water quality.

Sulphate: - There have been a number of studies conducted to determine the toxicity of sulphate in humans. Case reports of diarrhoea in three infants exposed to water containing sulphate at concentrations ranging from 630 to 1150 mg/liter have been presented. In the present investigation the value of phosphate was found

to be 0.51 in the NW-II which is higher than other dam water. Reported taste threshold concentrations in drinking-water are 250–500 mg/liter (median 350 mg/liter) for sodium sulfate, 250–1000 mg/liter (median 525 mg/liter) for calcium sulfate and 400–600 mg/liter (median 525 mg/liter) for magnesium sulphate.



TDS:-The presence of dissolved solids in water may affect its taste. The palatability of drinking water has been rated by panels of tasters in relation to its TDS level as follows: excellent, less than 300 mg/liter; good, between 300 and 600 mg/liter; fair, between 600 and 900 mg/liter; poor, between 900 and 1200 mg/liter; and unacceptable, greater than 1200 mg/liter. Water with extremely low concentrations of TDS may also be unacceptable because of its flat, insipid taste. In the present investigation the maximum value of TDS was found to be 523 ppm in the NW-II which is higher than other dam water.

Conclusion

The present paper deals with the study of Physico-chemical parameters of water. The result revealed that the COD and Magnesium exceeded the norm of WHO. The concentrations of other parameters are found in the maximum permissible limit. The results obtained from the present investigation shall be useful in future management of dam water.

Acknowledgment

Authors are very much thankful to Dr. D.V. Atkare, principal of Mahatma Fule Arts, Commerce and Sitaramji Chaudhari Science College Warud, for providing necessary facility for our research work.

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