

PHYSICO-CHEMICAL CHARACTERISTICS OF WATER FROM WAGHDARDI DAM, MANMAD (DIST. NASHIK) AT DIFFERENT SEASONS

BHATU SHIVAJI DESALE*, VISHNU ASHOK ADOLE*, RAHUL ASHOK SHINDE AND WAMAN KACHARU GAGARE

P.G. Department of Chemistry, M.G.V's Arts, Science and Commerce College, Manmad 423 104, Dist. Nashik (MS), India (Affiliated to SPPU, Pune)

(Received 5 August, 2021; Accepted 12 October, 2021)

ABSTRACT

Waghdardi dam was constructed on Panzan river in 1970 in Nashik District. During the present investigation, surface water samples were collected from Waghdardi dam during March 2020 to Feb 2021 and analyzed for water quality by examining various parameters like pH, temperature, electrical conductivity, total solids, total dissolved solids, alkalinity, hardness, dissolved O₂, dissolved salt etc. The importance of the water quality in regard to both human health and agricultural practices can not be ignored. Present study of Physico-chemical analysis of water are useful for contributing the knowledge about awareness of water pollution and needs of water purification techniques. Nearly all parameters were within the permissible limits. Hence the water was found to be suitable for drinking and irrigation purpose.

KEY WORDS : Physico-chemical parameter, Waghdardi dam, Water quality, Pollution.

INTRODUCTION

Lowering of water level during summer stagnation during winter and dilution in rainy season imparts a deep impression on water chemistry. Water quality is dynamic and its changing parameters require suitable treatments. The importance of the water quality in regard to both human health and agricultural practices can not be ignored. Surface water is collected in the dam from different out water sources. Some sources are polluted by human activities and other are polluted by agricultural waste cattle waste street runoff, which are flowing along with rain water and stagnate in dam in much large proportion specially during monsoon. The use of fertilizers, pesticides in agricultural practices as well as irrigation has a result in degradation of water quality, both direct by discharging waste and indirectly by increase demand of water. In rural areas this water is directly used for domestic, drinking, and agricultural practices. Ultimately human life and production from agricultural

practices get affected by using this polluted water. Many diseases spread over wide areas around the water bodies in which the polluted water is used. This can be avoided by using suitable water treatment. Physico-chemical analysis of water useful for suitability of water for a variety of purposes. This observation is also useful to estimate pollution load and quality of water from different sites of the dam, and give the direction towards required treatment. Many organic and inorganic impurities are present in soluble, insoluble and colloidal form in water with their corresponding effect. Present study of Physico-chemical analysis of water is useful for contributing the knowledge about awareness of water pollution needs of water purification technique, excess use of fertilizer, pesticides and its corresponding effect awareness of decomposition of agricultural waste and cattle waste and use as fertilizer.

Waghdardi dam was constructed on Panzan river in 1970 in Nashik District. The Dam is situated three kilometers from Manmad city in between 20014' 30"

to 20016' 30" North latitude and 74°26' 15" to 74°29' 10" East longitude. The study of such water bodies is necessary for estimation pollution and water quality point of view because the dam was constructed for drinking water supply to Manmad city, there for the present study was taken up with the objects. Survey and sites selection of site, Monthly variation in physico-chemical characteristics of water, Seasonal variation in chemical characteristics of sediments.

EXPERIMENTAL

The water samples were collected from Waghdardi dam from polluted and relatively less polluted areas. Samples were taken once in the second week of each month. They were collected from the depth of 0.5 m to 0.8 m, just below the surface in the morning during 09.00 a. m. to 11.00 a. m. in acid washed airtight polythene bottles of 2 litre capacity. Physico-chemical parameters were analyzed by standard methods of APHA (1989) and Trivedy and Goel (1986). The pH was recorded using pH meter (Equiptronics -Eq 610), while electrical conductivity by conductivity meter (Equiptronics - Eq 660).

RESULTS AND DISCUSSION

The results are presented in Table 1 and Figure 1 to Figure 7. Water temperature ranged between 24.28 °C and 29.45 °C during the study period which varied between summer and rainy seasons. The pH of water in all months was alkaline (6.90 to 8.36). Maximum pH (8.36) was observed in the month of May 2020 and minimum (6.90) in the month of July 2020. The electrical conductivity fluctuated from 0.314 to 0.621 mmhos/cm, and was found related to the concentration of ionized substances in water at a particular temperature. Dissolved oxygen showed maximum level of 6.1 while minimum of 0.8 mg/l. Solubility of oxygen decreased with increase in temperature (Sabata and Nayar, 1995). Total solids were found to be within the range of 683 to 915 mg/l. The value of total solids was higher in rainy season due to agricultural and, cattle wastes flowing along with the rain water through runoff from the catchment area. Total dissolved solids ranged from 391 to 592 mg/l, due to the accumulation of many dissolved substances, minerals, organic and inorganic pollutants and social activities. The value of alkalinity varied from 38.50 to 115 mg/l. The variation in alkalinity might be due to dissolved salt, dilution of surface water due to rain and change in

Table 1. Physico-chemical properties of water collected from Waghdardi Dam during March 2020 to Feb 2021.

Parameter	Summer			Rainy			Winter					
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Temp. °C	28.36	28.76	29.45	28.05	27.07	26.70	26.18	26.40	25.65	25.78	24.28	25.02
pH	7.32	8.09	8.36	7.79	6.90	7.12	7.19	7.30	7.29	7.38	7.44	7.11
Conductivity	0.386	0.410	0.314	0.397	0.445	0.515	0.406	0.439	0.517	0.490	0.597	0.621
Total Solid	702	687	732	810	890	915	758	710	690	700	683	672
Total Dissolved Solids	509	488	592	512	456	391	408	426	485	492	512	487
Total Hardness	46.0	63.0	49.0	45.0	34.6	33.0	42.5	41.0	45.0	34.0	60.0	46.4
Total Alkalinity	92.0	100.0	115.0	79.6	38.5	52.0	66.0	64.0	78.0	53.4	81.0	72.0
Dissolved O ₂	1.6	1.1	0.8	ND	ND	1.9	1.3	2.8	6.1	3.0	1.8	2.3
Dissolved Salt Ca	8.01	14.26	12.82	11.14	8.30	8.25	9.80	9.45	11.78	8.65	15.2	10.58

Note: All parameters are expressed as mg/l; conductivity mmhos/cm; Temperature °C; ND - not detectible

rate of decomposition of waste material (Hedge and Bharti, 1985). The value of hardness ranged from 33 to 63 mg/l. The calcium salt content was within normal limits. Calcium content ranged from 8.01 to 15.2 mg/l. In Table 2. physico-chemical characteristics of the sediments from waghdardi dam undertaken during March 2020 to Feb 2021 are given. The soil samples for sediments analysis were taken at the end of summer, rainy and winter seasons. The samples were collected from two sites of waghadardi dam in the morning in acid washed polythene bags. Physico-chemical parameters were analyzed by standard methods of Trivedy and Goel (1986). pH was recorded by using pH-meter (Equiptronics EQ-610) while electrical conductivity was recorded by conductivity meter (Equiptronics EQ-660). The results are presented in Table 2. The pH of sediment was low during rainy season while alkaline throughout the year. The value of electrical conductivity ranged between 0.292 to 0.322 mmhos being higher during summer season due to ionic concentration as was also recorded by Salodia

(1996). The value of alkalinity was recorded higher during summer while lower in rainy season. The change in alkalinity might be due to dissolved salt, dilution of water due to rain and decomposition of waste material. (Pawar and Deshmukh, 2004). Calcium content were found slightly higher during winter while lower at rainy and summer seasons. There were many reasons of pollutants and toxicants accumulating in surface water as a result of

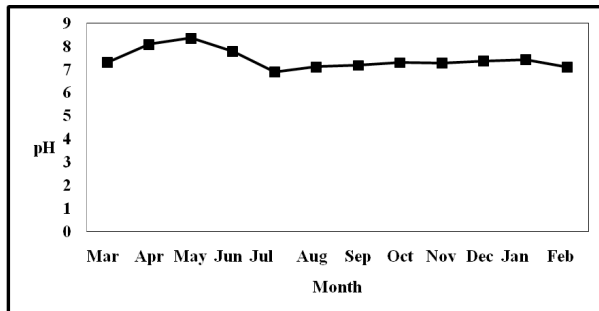


Fig. 1. pH vs Month

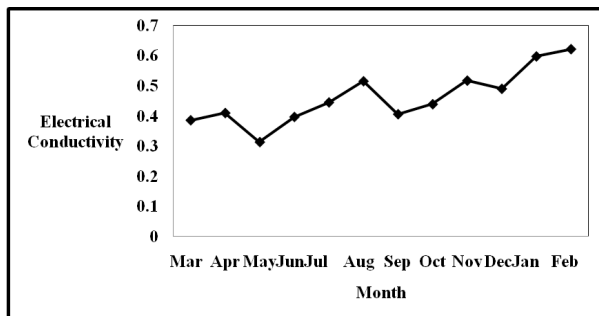


Fig. 2. Electrical Conductivity Vs Month

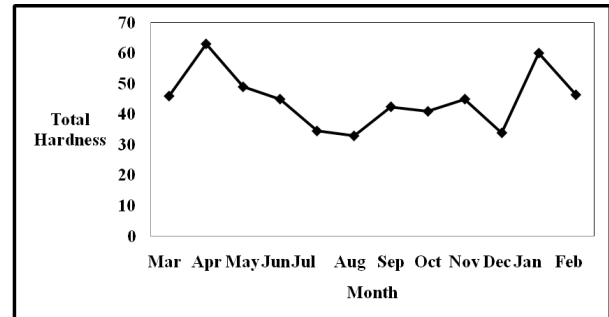


Fig. 4. Total Hardness Vs Month

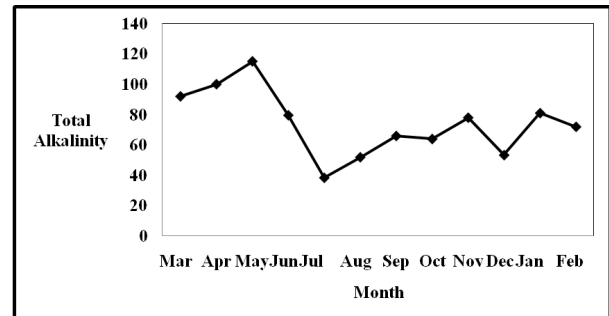


Fig. 5. Total Alkalinity Vs Month

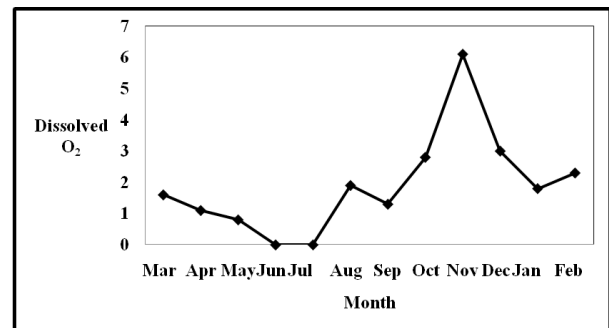


Fig. 6. Dissolved O₂ Vs Month

Table 2. Sediments analysis of Waghdardi dam for different season during March 2020 to Feb 2021

Parameter	Summer	Winter	Rainy
pH	8.29	8.03	7.48
Electrical Conductivity(mmhos)	0.322	0.306	0.292
Alkalinity (mg/l)	102	62.0	78.66
Ca Salt (mg/l)	11.33	10.03	9.55

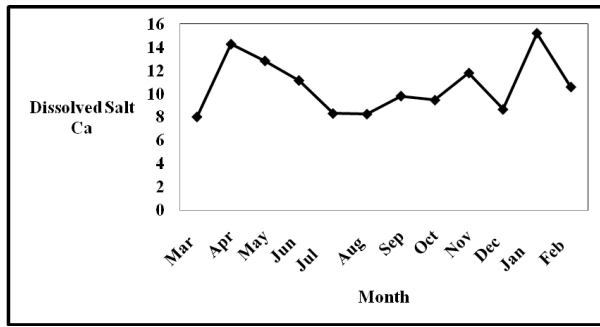
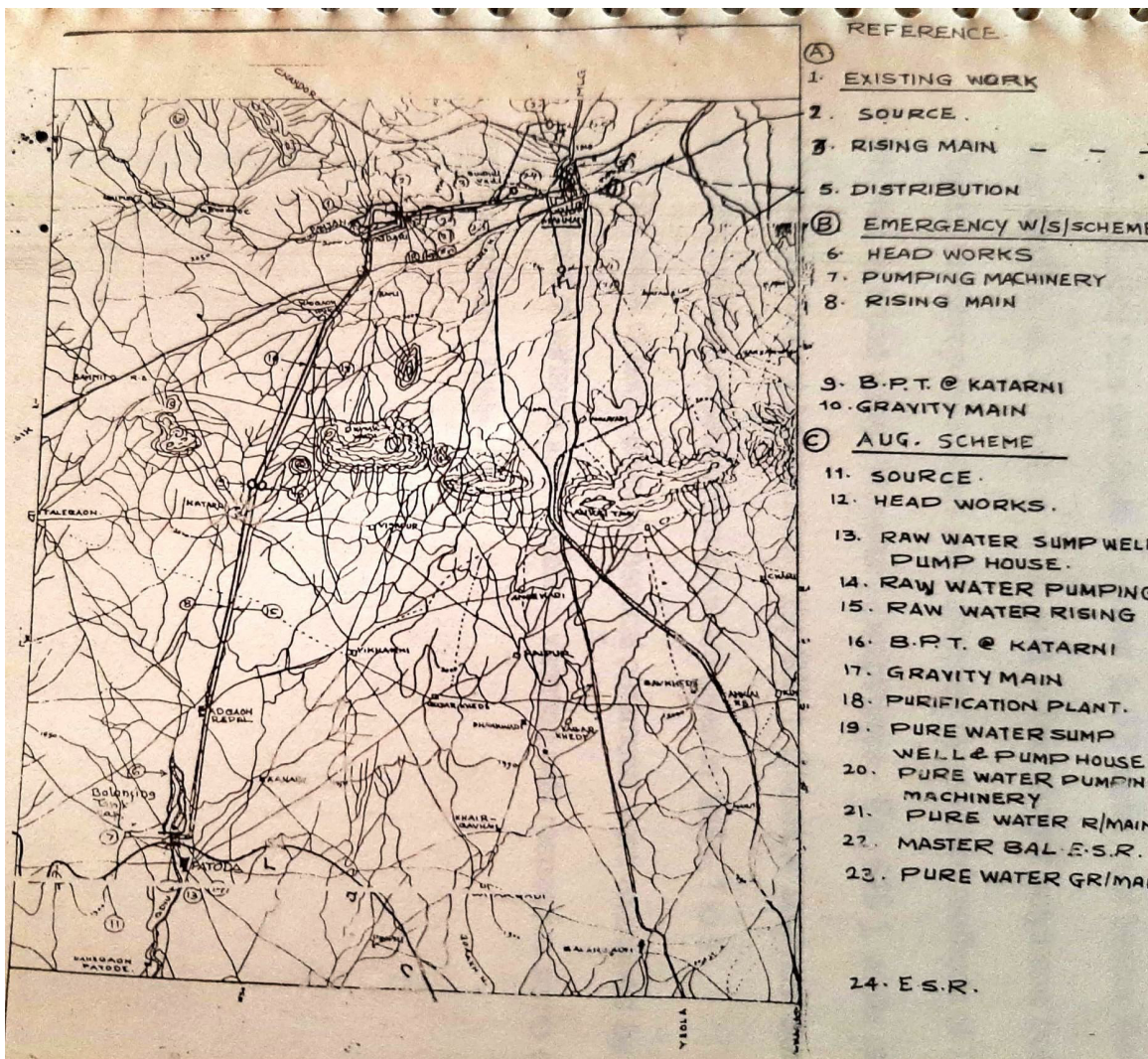


Fig. 7. Dissolved Salt Ca Vs Month

Table 3. WHO standard parameters value

Parameter	Value
pH	6.5-8.5
Conductivity	0.750
Total Solid	1500
Total Dissolved Solids	500
Total Hardness	300
Total Alkalinity	300
Dissolved O ₂	5
Dissolved Salt Ca	100

Note: All parameters are expressed as mg/l; conductivity mmhos/cm



Map of the Waghdardi Dam, Manmad (Nandgaon Tahsil), Dist-Nashik

REFERENCE	
(A) EXISTING WORK	EARTHAN DAM 122.40 MCFI. INTAKE 18" Ø CLARIFLOCCULADOR CAP - 1/2 HRS. RAPID SAND GRAVIER FILTER - 2 NOS CAP - 2ML PURE WATER SUMP CAP - 67.800 Ltr. RCC ESR CAP - 1 LAKH GLNS PIM 50 BHP. 450MM Ø CI LA CL L = 364 M. CAP - 2 LAKH GLNS.
2. SOURCE	
3. RISING MAIN	3" to 15" DIA.
5. DISTRIBUTION	
(B) EMERGENCY W/S/SCHEME	
6. HEAD WORKS	BALANCING TANK CAP - 6.20 MCFI. 300 BHP 2.15 LAKH Ltr/hr.
7. PUMPING MACHINERY	500MM Ø CI PIPE - 270Mtr.
8. RISING MAIN	300MM Ø CI 'B' CL PIPE - 1730M. 300MM Ø CI 'A' CL PIPE 6000M. 300MM Ø CI LA CL PIPE - 2000M. CAP - 28000 LITRS. 300MM Ø AC P _r PIPE
9. B.P.T. @ KATARNI	
10. GRAVITY MAIN	
(C) AUG. SCHEME	
11. SOURCE	FALKHED LT. BANK CANAL @ 75 KM.
12. HEAD WORKS	INTAKE PIPE 1000MM Ø R.C.C.
13. RAW WATER SUMP WELL DUMP HOUSE	CAP - 700 CUM.
14. RAW WATER PUMPING	215 BHP 3 NOS
15. RAW WATER RISING	1000MM Ø P.S.C. PIPE (1617, 18, 19, 20 kg/cm ² L = 9.60)
16. B.P.T. @ KATARNI	CAP - 900 CUM
17. GRAVITY MAIN	800MM Ø 6kg/cm ² L = 6.1 KM.
18. PURIFICATION PLANT	8.4MLD AT WAGHDARDI
19. PURE WATER SUMP WELL & PUMP HOUSE	CAP - 3,50,000 LITRS
20. PURE WATER PUMPING MACHINERY	CAP 65 BHP @ 3.06 000 LIT/hr.
21. PURE WATER R/MAIN	350MM Ø CI LA CL L = 60RM.
22. MASTER BAL. E.S.R.	
23. PURE WATER GR/MAIN	TOTAL L = 7170 M. 800MM Ø PVC 6kg/cm ² - 1180M. 700MM Ø P.S.C 6kg/cm ² - 812 600MM Ø P.S.C. 8kg/cm ² - 3328 400MM Ø P.S.C. 8kg/cm ² - 1609
24. E.S.R.	I CAMP AREA CAP. 10,60,000 LITRES. II 6,70,000 LIT. CAP NEAR COLLEGE (AMBEDKAR NAGAR) III HUDCO (BUDHALWADI) CAP - 4,60,000 LITRES.
25. DIST/SYSTEM	FROM 100MM Ø TO 450MM Ø AC & CI PIPES - L = 39280 M.
M. J. P. SUB DIVN MANMAD	
DRN BY	AUG TO MANMAD W/S/S
CHD BY	TAL - NANDGAON DIST NASIK
TRD BY	INDEX MAP
COMP BY	SCALE
	S.D.E. E.E. S.E. C.E.

Description of the Map

contamination of catchment area from many dissolved substance, organic and inorganic pollutants, colloidal particles, excess use of fertilizers and pesticides in agricultural practices. The standard values of these parameters are given in Table 3.

CONCLUSION

After comparison of studied parameters values with the standard values recommended by WHO, we can conclude that there is marginal difference in the parameter values. Thus, the dam water is safe after some treatment like chlorination or Reverse Osmosis method for drinking purpose and ultimately for

domestic use.

REFERENCES

- APHA, 1989. American Public Health Association, *Standard Methods for Examination of Water and Waste Water*. (17h Ed.) Washington D.C.
- Hedge, C.R. and Bharti, S.G. 1985. *India Bot. Soc. Sagar*. 32: 24.
- Sabata, B.C. and Nayar, M.P. 1995. *River Pollution in India*. A case study of ganga river. APH publishing corp, New Delhi pp. 223
- Trivedy, R. K. and Goel, P.K. 1986. *Chemical And Biological Methods For Water Pollution Studies*, Environmental Publication, Karad.