



Analysis Of The Physicochemical Parameter Of Wardha River Water In Warora Tehsil, District Chandrapur (M.S.), India

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ABSTRACT

In this paper we discuss about the analysis of various Physico-chemical parameters of Wardha River water collected from three different selected sites such as Site A- Soit, Site B- Marda and Site C- Turana were studied during the month of November 2022 to April 2023. The physical parameters such as Temperature, pH, Electrical Conductivity, Total Dissolved Solid and Chemical parameters such as Sodium, Potassium, Biological Oxygen Demand and Chemical Oxygen Demand, Dissolved Oxygen, Alkalinity, Chloride, Sulphate, Calcium Hardness, Total Hardness, were studied into the laboratory by using Standard Protocol. The conductivity of Wardha river water at Soit site is increased because of may be the effect of various activities performed at river site. In site C Turana dissolved oxygen is more as compared to the other two sites. The CH is minimum in the month of November and maximum in the month of April at the three sites.

KEYWORDS: Water, Wardha River, Physico-chemical Parameters.

1.INTRODUCTION:

Warora Taluka is situated in the western part of Chandrapur District of Maharashtra State lying between the latitude 20° of and 23° west and longitudinal of 79 and 00° south and it extended over an area 22.50 km² (8.69 sq m.). Average rainfall of the Taluka is 1200 mm with maximum temperature is 48°C in summer and it is about 10°C in winter. In Warora Taluka there is one biggest river Wardha from west to eastern part of Taluka and lakes are also present in Taluka. The total forest area found in Taluka is 13,000 hectares and the total crop area is 72,000 hectares. The vegetable cultivation is also taken and total vegetable

area is 73 hectares. Rice is mainly cultivated in rainy season from July to October and irrigation system is available from river Wardha, lakes and tube well etc. In Warora taluka the Wardha river is about 30 Km.

2. MATERIAL AND METHOD:

2.1 Study area:

Site selection for Water sample analysis

Site area	Site name	Away from Warora tehsil	Latitude	Longitude
Soit	Site A- Soit	27km	20.279999° N	78.819322° E
Marda	Site B- Marda	11km	20.2253° N	78.9387° E
Turana	Site C- Turana	9.2km	20.206819° N	78.963534° E

2.2 Collection of Water sample

Water samples for Physico-chemical analysis was collected from three different sites of Wardha river area from November 2022 to April 2023 in Warora taluka. Water samples were collected in two liters well labelled plastic bottles, in morning hours. At the time 5am. To 8am. on the basis of entry of Wardha river three sites were selected and end of river in Warora taluka.. The temperature is measured by using thermometer. And other parameters such as pH, Electrical Conductivity , Total dissolved solid, Dissolved Oxygen, Alkalinity, Chloride, Sulphate, Calcium hardness, Total hardness, Sodium, Potassium, Biological Oxygen Demand, Chemical Oxygen Demand, content were estimated in the laboratory by using standard protocol. The water samples were immediately brought in to the laboratory for the estimation of various physicochemical parameters.

3. OBSERVATION TABLE :

Table no. 1 showing physico-chemical parameter of wardha river in soit area

Sr. no	Parameter of water	UNIT	NOV.	DEC.	JAN.	FEB.	MARCH	APRIL
	PHYSICAL PARAMETER							
1	Temperature	°C	23.2	24	26	27	27.5	29
2	pH		8.1	8.3	8.4	8.6	8.5	8
3	Electrical conductivity	umhos/cm	462	582	679	748	969	1035
4	Total Dissolved Solids	mg/L	276	298	343	387	401	431
	CHEMICAL PARAMETER							

5	Dissolved Oxygen	mg/L	8.2	7.8	7.2	6	6.6	6.3
6	Alkalinity	mg CaCO ₃ /L	254	279	228	267	234	293
7	Chloride	mg/L	127	114	41	42	49	55
8	Sulphate	mg/L	17.1	19.4	21.6	24.7	28.3	30.8
9	Calcium Hardness	mg CaCO ₃ /L	236	249	253	257	260	265
10	Total Hardness	mg CaCO ₃ /L	200	219	223	235	250	271
11	Sodium	mg/L	42.1	39.6	32.4	36.3	38.7	40.5
12	Potassium	mg/L	0.6	0.4	0.5	0.6	0.7	0.7
13	Biological Oxygen Demand	mg/L	2.1	2.5	3.0	3.7	4.1	4.6
14	Chemical Oxygen Demand	mg/L	12.9	13.1	13.6	14.0	14.4	14.9

Table no. 2 showing physico-chemical parameter of wardha river in marda area

Sr. No	Parameter of water	UNIT	NOV.	DEC.	JAN.	FEB.	MARCH	APRIL
PHYSICAL PARAMETER								
1	Temperature	°C	23	24	25.7	26	28	28.5
2	pH		8.2	8.6	8.3	8.5	8	8.1
3	Electrical conductivity	umhos/cm	345	367	428	479	572	689
4	Total Dissolved Solids	mg/L	251	264	286	312	359	381
CHEMICAL PARAMETER								
5	Dissolved Oxygen	mg/L	8	8.4	7.5	8.1	7.9	7.1
6	Alkalinity	mg CaCO ₃ /L	264	249	274	239	231	245
7	Chloride	mg/L	124	119	46	44	48	51
8	Sulphate	mg/L	18.2	18.9	19.7	22.5	23.6	24.3
9	Calcium Hardness	mg CaCO ₃ /L	226	230	231	233	239	248
10	Total Hardness	mg CaCO ₃ /L	184	201	209	215	216	238

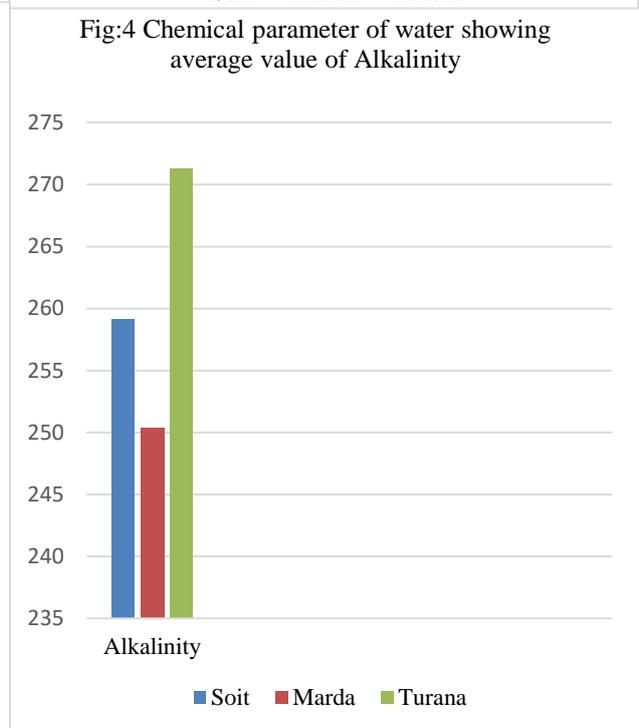
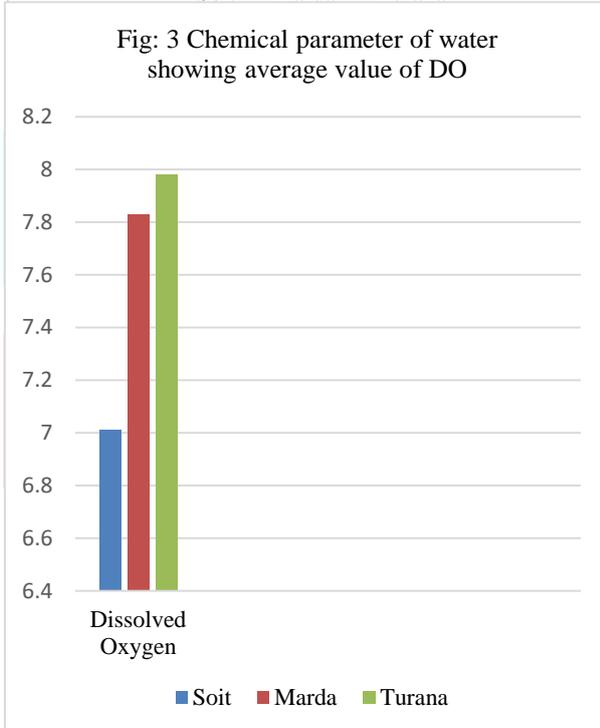
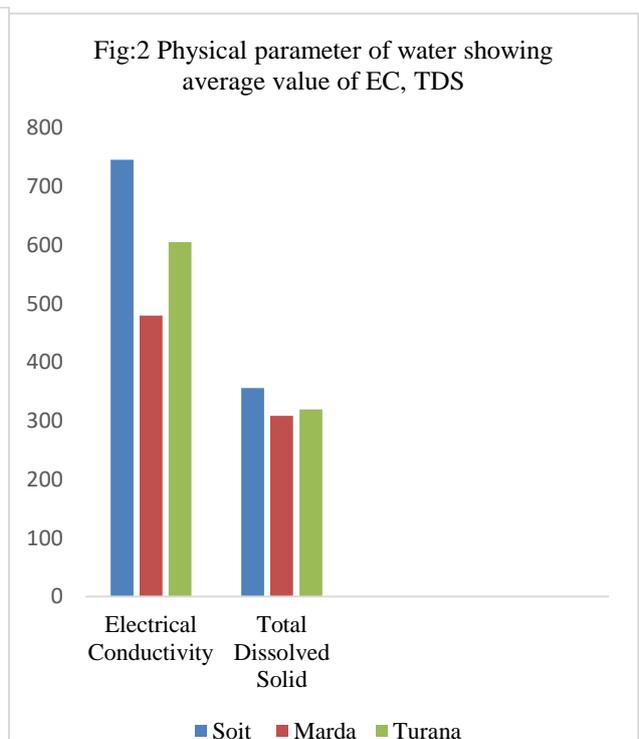
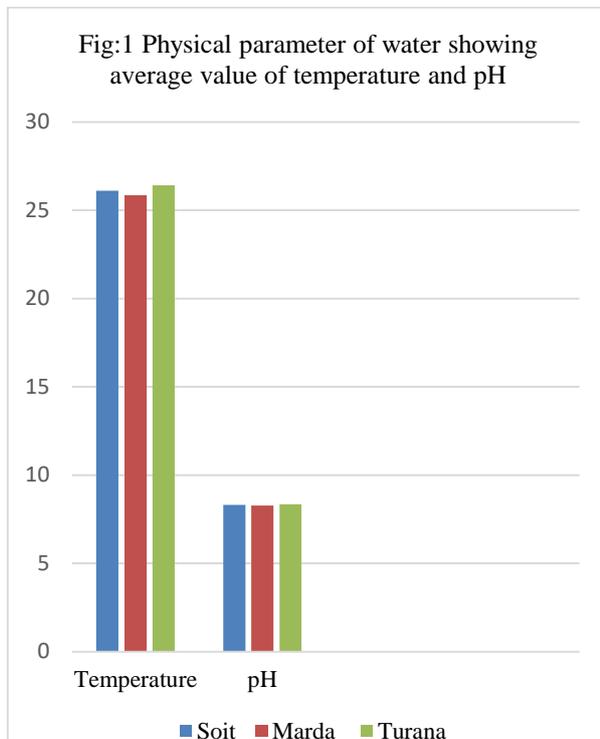
11	Sodium	mg/L	41.8	40.3	31.8	35.8	37.3	39.1
12	Potassium	mg/L	0.6	0.5	0.3	0.4	0.6	0.5
13	Biological Oxygen Demand	mg/L	1.9	2.4	2.9	3.3	4.0	4.4
14	Chemical Oxygen Demand	mg/L	9.3	10.3	10.9	11.1	11.4	11.8

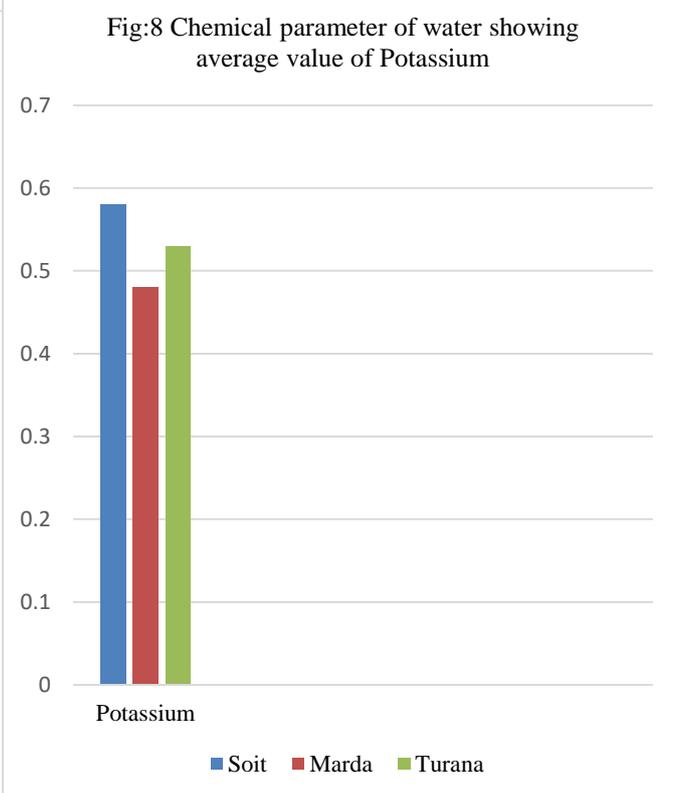
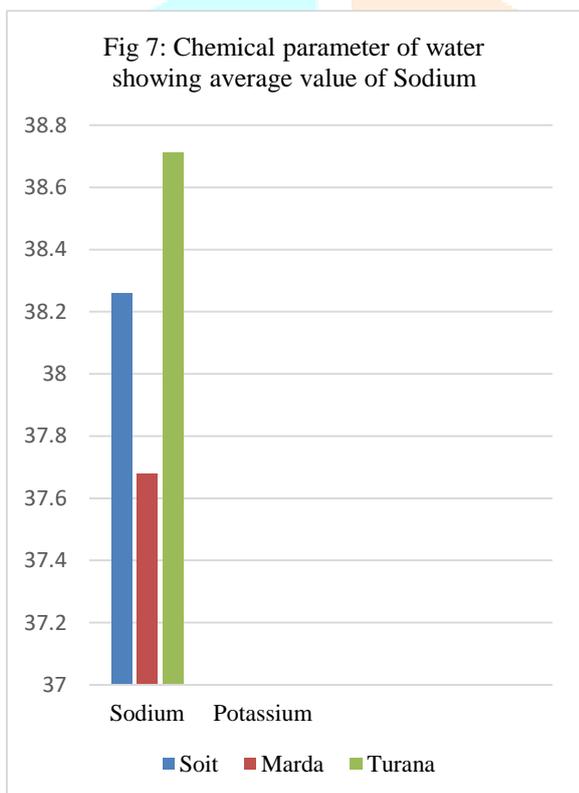
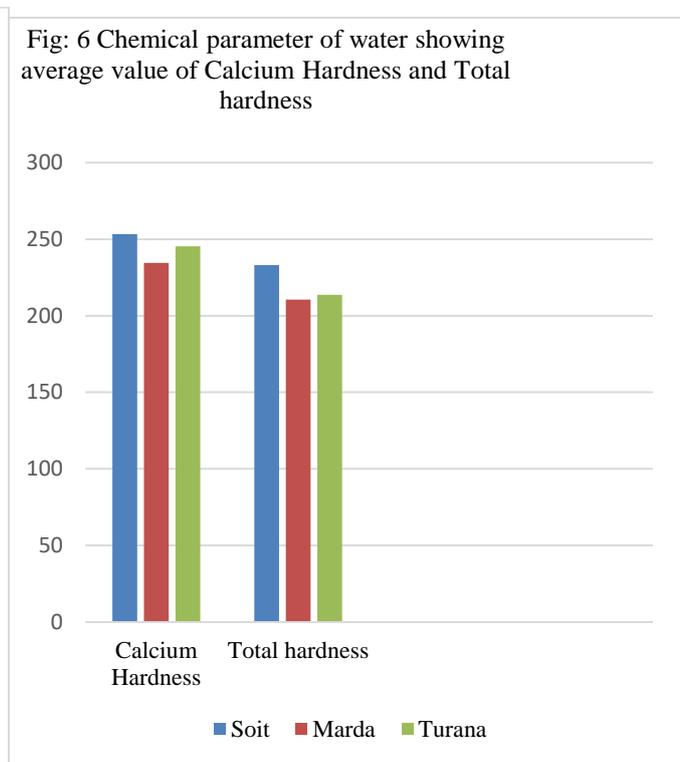
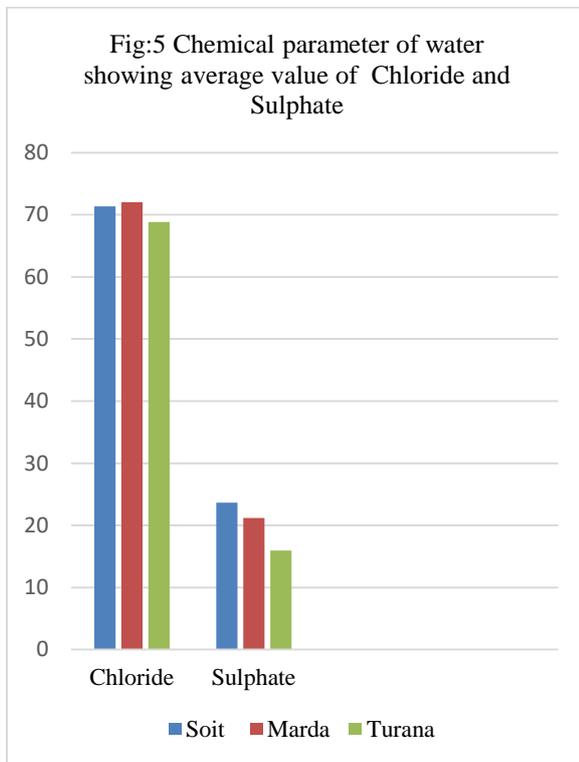
Table no. 3 showing physico-chemical parameter of wardha river in turana area

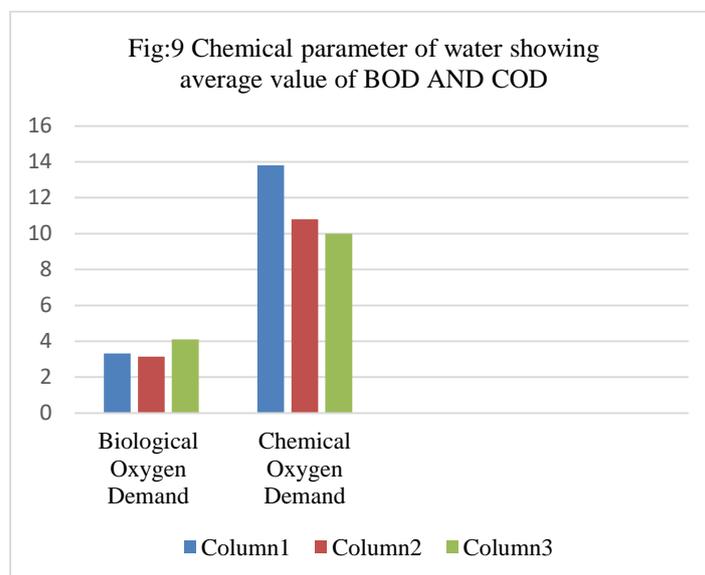
Sr.no	Parameter of water	UNIT	NOV.	DEC.	JAN.	FEB.	MARCH	APRIL
	PHYSICAL PARAMETER							
1	Temperature	°C	23.2	24.6	26.7	27.3	28.1	28.6
2	pH		8.1	8.2	8.4	8.3	8.5	8.6
3	Electrical conductivity	umhos/cm	533	589	593	607	629	681
4	Total Dissolved Solids	mg/L	267	279	303	327	341	399
	CHEMICAL PARAMETER							
5	Dissolved Oxygen	mg/L	8.5	7.8	7.1	8.6	8.2	7.7
6	Alkalinity	mg CaCO ₃ /L	272	285	287	279	264	241
7	Chloride	mg/L	122	114	39	42	46	50
8	Sulphate	mg/L	16.8	15.3	16.4	15.2	15.9	16.1
9	Calcium Hardness	mg CaCO ₃ /L	235	242	243	248	250	254
10	Total Hardness	mg CaCO ₃ /L	182	203	213	221	227	236
11	Sodium	mg/L	41.9	40.6	34.7	36.1	38.9	40.1
12	Potassium	mg/L	0.6	0.6	0.4	0.5	0.5	0.6
13	Biological Oxygen Demand	mg/L	2.9	3.5	4.2	4.5	4.7	4.9
14	Chemical Oxygen Demand	mg/L	9.1	9.5	9.7	10.2	10.6	10.9

Table no. 4 showing average value and standard deviation value of physico-chemical parameter of wardha river of soit, marda and turana area

Sr.no	Parameter of water	UNIT	SOIT	MARDA	TURANA
	PHYSICAL PARAMETER				
1	Temperature	°C	26.11 ± 2.19	25.86 ± 2.15	26.41 ± 2.10
2	pH		8.31 ± 0.23	8.28 ± 0.23	8.35 ± 0.18
3	Electrical conductivity (EC)	umhos/cm	745.83 ± 221.49	480 ± 131.02	605.33 ± 48.86
4	Total Dissolved Solids (TDS)	mg/L	356 ± 60.89	308.83 ± 52.17	319.33 ± 47.97
	CHEMICAL PARAMETER				
5	Dissolved Oxygen (DO)	mg/L	7.01 ± 0.86	7.83 ± 0.46	7.98 ± 0.56
6	Alkalinity	mg CaCO ₃ /L	259.16 ± 25.41	250.33 ± 15.99	271.33 ± 17.11
7	Chloride	mg/L	71.33 ± 38.64	72 ± 38.44	68.83 ± 38.34
8	Sulphate	mg/L	23.65 ± 5.27	21.2 ± 2.59	15.95 ± 0.62
9	Calcium Hardness	mg CaCO ₃ /L	253.33 ± 10.13	234.5 ± 7.86	245.33 ± 6.74
10	Total Hardness	mg CaCO ₃ /L	233 ± 24.98	210.5 ± 17.89	213.66 ± 19.22
11	Sodium	mg/L	38.26 ± 3.46	37.68 ± 3.58	38.71 ± 2.77
12	Potassium	mg/L	0.58 ± 0.11	0.48 ± 0.11	0.53 ± 0.08
13	Biological Oxygen Demand (BOD)	mg/L	3.33 ± 0.96	3.15 ± 0.94	4.11 ± 0.77
14	Chemical Oxygen Demand (COD)	mg/L	13.81 ± 0.76	10.8 ± 0.88	10 ± 0.68







4. RESULT AND DISCUSSION :

Temperature:- The temperature of Site A- Soit , Site B- Marda and Site C-Turana is ranges between 23 °C to 29 °C. The temperature is measured at the time of water sample collection. The temperature of river water is affect the biological process in river. The optimal temperature between 20 to 30 C is required for algae growth. Warmer water leads to increased algae growth. Similar result was observed by Singh et al. (2017) the temperature ranges 22 °C to 28 °C from Physicochemical characteristics of River water [11].

pH:- The pH ranges between 8 to 8.7 into three site. The variation of pH were found because due to the change in alkalinity of water sample. At the day time algae absorb carbon dioxide from the water for cell growth, increase pH value. At night the pH value is decreasing. The pH between 8.2 to 8.7 it is alkaline water suitable for algae growth. Similar result was observed by Gaurkar A.R., et al. (2016) pH ranges between 7.29 to 8.18 from Study of physicochemical parameters and correlationship among Different parameters in water of Kathani River, Gadchiroli, Maharashtra [3].

Electrical conductivity (EC):- The EC of Site Soit, Marda and Turana is range between 345 umhos/cm to 1035 umhos/cm was obtained. The conductivity of Wardha river water at Soit site is increased because of may be the effect of various activities performed at river site. When decreasing the conductivity then increasing the algae density. The EC produce by the algae are cyanobacteria, microalgae was present in river. Parallel funding were reported by Mahatale M. A. et al. (2015) EC ranges between 321 umhos/cm to 1201 umhos/cm from An assessment of Zarpat River water quality using Physicochemical studies [8].

Total Dissolved Solid (TDS):- The TDS of three site range between 251 mg/L to 431 mg/L. The human activity of local peoples is help to increase the value of TDS in Soit area and in Marda dam area the less human activity they help decreasing the TDS value. In Turana site the TDS value increases because of human activity into the site. Similar result were observed by Gulhane M. N. (2022) TDS ranges 210 mg/L to 607 mg/L from Analysis of monthly variation in water quality of Wardha River using physicochemical parameters [4].

Dissolved Oxygen (DO) :- The Dissolved oxygen in Wardha river water sample ranges between 7.1 mg/L to 8.5 mg/L was observed. In site C Turana dissolved oxygen is more as compared to the other two site. It means the dissolved oxygen is suitable for survival of aquatic life. The D.O. is depends on the temperature. In place to place and time to time the Dissolved oxygen content of water will be changes. Low DO value help the excessive algae growth caused by phosphorus. DO revealed that ranges 4.9 mg/L to 7.5 mg/L by Gourkar A. R. et al. ((2015) from Study of physicochemical parameters and correlationship among Different parameters in water of Kathani river, Gadchiroli, Maharashtra [3].

Alkalinity:- The alkalinity of three Site ranges between 241 mg CaCO₃/L to 293 mg CaCO₃/L . The Soit area river water is more buffering capacity as compared to the Marda and Turana. The alkalinity of Soit area water is high then it decrease in Marda dam area and again they slightly increase in Turana area. The alkalinity of water is increasing – decreasing and again increasing it may be due to the local factors etc. Alkalinity and pH are closely related, pH value is decided the water alkalinity. Increases the alkalinity that are harmful to aquatic life. Similar result was observed by Singh et al. (2019) alkalinity ranges between 241 CaCO₃/L to 293 CaCO₃/L from Physicochemical Analysis of River Water Quality [13].

Chloride:- The Chloride value of river water sample of Site A, B and C is ranges between 39 to 127 mg/L respectively. The local quality of soil is may be decided the Chloride value of river water. The maximum value of chloride content in Soit area represent the organic pollution by the animal and human being. The low value found in the month of January is 39 mg/L in Turana area was evaluated. If the chloride value increasing the decreases the green algae growth. Similar funding were reported by Khalokar S. P. (2020) Chloride ranges 45 mg/L to 140 mg/L from Physicochemical analysis of Purna River water from Asegaon Purna of Dist. Amravati, Maharashtra [5].

Sulphate:- The Sulphate value is ranges between 15.2 to 30.8 mg/L respectively. In site A Soit more sulphate as compaired to the other two site. It means that The sedimentary rocks and pollutants are present in river water. Sulphates strongly affect on photosynthesis, carbon and nitrogen metabisim. It means there is presence of microalgae cells.

Calcium Hardness (CH) :- The Calcium Hardness in river water sample ranges between 226 to 253 mg/L . The CH lowest in the month of November and highest in the month April at the three site. Because of the river water level is high in the month of November and then the water level is decreasing in the month of April. The calcium hardness is high because the presence of bicarbonates, sulphates, magnesium and chlorides of calcium. The calcium and magnesium is rich then water is hard and calcium and magnesium is poor then water is soft. The CH is decreases in November then increases in the month of April. Minimum range of CH in water it helps the algae production and when it is soft means low calcium then decreases the algae growth.

Total Hardness:- The total hardness in Wardha river water sample was ranges between 182 mg CaCO₃/L to 271 mg CaCO₃/L observed. The dissolved salts present in river water is decided the hardness of water. The entry of river in Warora tehsil in site A Soit the Total hardness is minimum in the month of November and maximum in the month of April. The present of common inorganic salts in river water that's why the hardness of water is decreases at the three site. The total hardness is minimum in Site B Marda dam area as compared to the other two site. In river site the domestic activities perform by the neighbouring villagers that's why the hardness of water may be increases. The magnesium is present in the form of Sulphate in river water sample. Similar result were reported by Tiwari D., et al. (2012) Total Hardness ranges between 84 CaCO₃/L to 960 CaCO₃/L from Assessment of Water Quality in terms of Total Hardness and Iron of some Freshwater Resources of Kanpur and its Suburbs [1].

Sodium:- In Wardha river water sample the sodium was estimated is ranges between 31.8 mg/L to 42.1 mg/L. The maximum value found in the month of November in Soit area and minimum value found in the month of January in Marda area. It indicates the maximum rocks present in Soit area and minimum rocks present in Marda dam area and Turana area. The presence of sodium in river water depend on the presence of rocks in river because rocks contain NaCl. In which the presence of green microalga present. When increase the salinity it helps to the growth of algal cells within a specific range. Sodium value 30 mg/L is required for algae growth.

Potassium:- The potassium were found in river water sample is ranges between 0.4 mg/L to 0.7 mg/L in respectively. The maximum value of potassium was found in the month of March and April in Soit area. The minimum value was found in the month of January in Marda area.

Biological Oxygen Demand (BOD):- The BOD were found to be in water sample of Soit to Turana is ranges between 1.9 mg/L to 4.9 mg/L. In Soit area the BOD is high because the presence of high organic load in river water and less BOD in Marda area. The microorganisms required oxygen. The BOD is a measurement of the oxygen it helps breaking down organic matter to stable inorganic forms. The BOD value is less because the population of phytoplankton and zooplankton, industrial waste, and temperature. Similar result were reported by Kumar, et al. (2020) BOD ranges between 1.9 mg/L to 4.9 mg/L from Water Quality Assessment of a River Using Physicochemical Parameters [7].

Chemical Oxygen Demand (COD):- The COD is ranges between 9.1 mg/L to 14.9 mg/L respectively. COD were found in river water sample. In river water the oxygen is required in the form of COD to the organic substances in water for oxidation. The present study the COD value is decreasing from Soit to Turana area. The high value found in Soit area in the month of April and less value found in Turana area in the month of November. Similar funding were observed by Gaurkar A.R., et al. (2015) COD ranges between 4.49 mg/L to 12.50 mg/L from Study of physicochemical parameters and correlationship among Different parameters in water of Kathani river, Gadchiroli, Maharashtra [3].

5. Conclusion

During the study water samples were collected from three sites of Wardha River, of Warora taluka, District Chandrapur, Maharashtra. Water samples were collected from November 2022 to April 2023 for physicochemical analysis. There are total 14 parameters had been studied. The water of the river is alkaline water because the pH value is greater than seven. The monthly variation in physicochemical parameter is changes due to the weather, temperature, rainfall, human activity in river side etc. The alkalinity, calcium hardness and total hardness can affect the algal growth. High level of COD reduced DO level in river water. When the EC increases the salinity of water increases.

6. METHODS USED FOR THE ESTIMATION

Table no. 5 Methods used for the Estimation of Physicochemical parameter of River Water

Sr no.	Parameter	Methods
1	Temperature	Thermometer
2	pH	Potentiometric method
3	Electrical conductivity	Conductivity cell potentiometric
4	Total dissolved solid	Gravimetric after filtration method
5	Dissolved oxygen	Winkler Azide modification titrimetric
6	Alkalinity	Titration method
7	Chloride	Argentometric titration
8	Sulphate	Nephelometry
9	Calcium Hardness	EDTA titrimetric method
10	Total Hardness	EDTA titrimetric
11	Sodium	Flame emission photometric method
12	Potassium	Flame emission photometric method
13	Biological Oxygen Demand	bottle incubation for Three days at 27 C
14	Chemical Oxygen Demand	Open Reflux method

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