Physiochemical characteristics of Pimpri reservoir from Udgir region Dist Latur Maharashtra

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Abstract

Pimpri reservoir (Latitude.18.42018902^0 N Longitude 77.12942167^0 E) is constructed on river Lendi, a tributary of Manjra river which later on empties in river Godavari is earthen Dam present near village Pimpri Tq Udgir Dist Latur of 54.54 ha constructed for irrigation purpose. Pimpri reservoir is near town Udgir hence the domestic sewage is directly introduced in this river hence this reservoir is highly polluted by organic matter and became unfavorable for drinking purpose. So water quality check up is important in recent study. Physico-chemical parameters of Pimpri reservoir were investigated during December 2020 to November 2021 and this is the first effort in this direction. During the present study the investigated physio chemical parameters are Temperature is 22.9^{O}C to 31.2^{0}C with mean temperature 27.14^O C, Transparency 42 to 75 cm with mean transparency 57.41cm, pH 7.2 to 9.3 cm with mean pH 8.6,Dissolved O_2 is 0.3 to 6.5 mg/litre with mean DO 2.60 mg/litre, Free CO_2 is 0.2 to 1.2 mg/litre with mean Free CO_2 0.63 mg/litre Total Alkalinity130 to 248 mg/litre with mean 203.5 mg/litre, Carbonate 4 to 28mg/litre with mean 16.83 mg/litre and Bicarbonate 126 to 220 mg/litre with mean 186.5 mg/litre, Total Hardness 190 to 290 mg/litre with mean 247.83 mg/litre, Calcium hardness 79.80 to 126 mg/litre with mean 103.42 mg/litre, Magnesium hardness 25.86 to 49.24 mg/litre with mean 35.03 mg/litre, calcium 31.98 to 50.50 mg/litre with mean 41.58 mg/litre, Chlorides43.95 to 106.32 mg/litre with mean Chloride 66.93 mg/litre, Salinity 81.92 to 191.94mg/litre with mean 120.85 mg/litre and TDS 420 to 580 mg/litre with mean 522.50 mg/litre were analyzed and recorded.

Key Words: Pimpri reservoir, Physico-chemical, Water parameters.

Introduction

Water is important component of environment for all living organism and it is used for drinking purpose, for industrial use and most in agricultural field. Without water life does not exist. But now days we are facing water related problems like water contamination due to extensive anthropogenic emissions of nutrients and sediments. The quality of surface water is becoming worst in the past few decades due to growing population, urbanization, agriculture, and industrialization. Udgir Tahsil of Latur District is one of the most important agriculturally developed area of southeast Maharashtra having 97 villages (Censes2011). The region receives average 600-700 mm rainfall annually. In this region there are some minor irrigation water reservoirs which form a source of water. These water bodies are very useful to the local people in various ways. Pimpri reservoir (Latitude.18.42018902^0 N Longitude 77.12942167^0 E) is present 5 km away from town Udgir constructed on river Lendi, a tributary of Manjra river which later on empties in river Godavari a earthen Dam present near village Pimpri Tq Udgir Dist Latur of 54.54 ha constructed for irrigation purpose. Pimpri reservoir is near town Udgir hence the domestic sewage is directly introduced in this river hence this reservoir is highly polluted by organic matter and became unfavorable for drinking purpose. So water quality check up is important in recent study. To resolve this problem, it is necessary to carry out water quality assessment, planning, and management, in which water quality monitoring plays an important role. Physico-chemical parameters of Pimpri reservoir like, Temperature, Transparency, pH, O2, Co_2, Calcium, Total Alkalinity, Carbonate, Bicarbonate, Total Hardness, Calcium hardness, Magnesium hardness, Calcium, Chlorides, Salinity and TDS were investigated during December 2020 to November 2021 and this is the first effort in this direction.

Material and Method.

Monthly Physical parameters like depth, Temperature and Transparency/turbidity and chemical parameters like pH and Total dissolved Solids were studied of the Pimpri reservoir on site by using different equipments Viz, water Temperature is recorded by using thermometer ranging 0^0 to 100^0 C. Transparency by using Secchi disc, pH by using Digital pH meter, TDS by digital TDS meter. Monthly water is collected in two liter clean polyethylene bottles and kept in dark place safely at normal temperature during transportation and brought to laboratory for further Chemical Parameter estimation of reservoir water samples like Dissolved O_2, Free CO_2, Alkalinity(Carbonate and Bicarbonate), Total Hardness, Calcium hardness, Magnesium hardness, calcium, Chlorides and salinity were analyzed in the laboratory by titration method given in "Methodology for water analysis" by Kodarkar *et al.* 1998 (IAAB [1] and APHA standard methods (1985, 2005) [2, 3].

Results and Discussion

.Physical parameters

1.Temperature (^{O}C); The surface water temperature was recorded with the help of a standard centigrade thermometer in^{O}C. Water temperature plays an important role in influencing the periodicity occurrence and abundance of phytoplankton. Reservoir having water temperature more than 22 ^{O}C are the highly productive reservoirs. Seasonal variation in water temperature is presented in Table 1 and graphically presented in Graph 1 and A. During December 2020 to November 2021 water temperature range in Pimpri reservoir is 22.9^{O}C to 31.2^{0}C with mean temperature 27.14^{O}C, the minimum Temperature 21.9^{0}C was recorded in month December 2020 where as Maximum Temperature 31.2^{0}C was recorded in June 2021.

2.Transparency/Turbidity; Turbidity was directly calculated from transparency (cm)**.** The Transparency (light penetration) of water was measured by a Secchi disc of 20 cm diameter with four quadrants by on upper surface painted alternate black and white, is used. The Secchi disc was lowered into the water with the help of a graduated rope to a hook in the center. Two readings of depth; one at a point when the disc just disappears (A) and the other at which it reappears (B) was taken as Secchi disc transparency in cm. Water transparency is dependent on turbidity, which is directly proportional to the amount and density of suspended matter. Seasonal variation in water Transparency is presented in Table 1 and graphically presented in Graph 1 and B. During December 2020 to November 2021 Transparency in cm range at Pimpri reservoir is 42 to 75 cm with mean transparency 57.41cm, The minimum Transparency 48 cm recorded at in month June 2021 where as Maximum Transparency 75 cm was recorded at in month May and June 2021.

CHEMICAL PARAMETERS

1.pH or Hydrogen Ion concentration . The hydrogen ion concentration (pH) values were recorded at the water sample collection sites with the help of digital pH meter. Seasonal variation in water pH is presented in Table 1 and graphically presented in Graph 1 and C .During December 2020 to November 2021 pH range at Pimpri reservoir is 7.2 to 9.3 cm with mean pH 8.66, The minimum pH 7.2 recorded at Pimpri reservoir in month December 2020 and January 2021 where as Maximum pH 9.3 was recorded at Pimpri reservoir in month June and July 2021.

2.Dissolved oxygen (mg/l). The water samples were collected from fresh water bodies in early morning in 2 litre water containers bottles and brought to the laboratory for estimation of dissolved oxygen by wrinkler's method. Seasonal variation in Dissolved oxygen (DO) in reservoir waters is presented in Table 1 and graphically presented in Graph 1 and D. During December 2020 to November 2021 Dissolved oxygen (DO) in range at Pimpri reservoir is 0.3 to 6.5 mg/litre with mean DO 2.60 mg/litre, The minimum Dissolved oxygen (DO) 0.3 mg/litre recorded at Pimpri reservoir in month January 2021 where as Maximum Dissolved oxygen (DO) 6.5mg/litre was recorded at month August 2021.

3.Free carbon di-oxide (mg/l). The sample containing free CO_2 in the form of H_2CO_3 is titrated against an alkali (0.22N NaOH) and resultant change in PH from acidic to neutrality to alkalinity is detected by phenolphthalein. 1 ml of 0.2272 N NaOH = 1 mg of free CO2. Seasonal variation in Free Carbon di-oxide (CO_2) in reservoir waters is presented in Table 1 and graphically presented in Graph 1 and E. During December 2020 to November 2021 Free Carbon di-oxide (CO_2) in range at Pimpri reservoir is 0.2 to 1.2 mg/litre with mean Free Carbon di-oxide (CO_2) 0.63 mg/litre, The minimum Free Carbon di-oxide (CO_2) is 0.2 mg/litre in month January 2021 where as Maximum Free Carbon di-oxide (CO_2) 1.2mg/litre was recorded at Pimpri reservoir in month March 2021

4.Total Alkalinity (mg / l). Alkalinity is defined as quantitative capacity to neutralize an acidic solution, the alkalinity to waters is mainly implanted by three predominant bases; carbonates(CO3), bicarbonates (HCo3) and hydroxides (OH). Thus alkalinity is estimated as total. Water with free CO2 also acts on CaCO3 = Ca (HCO3). Water samples with high planktonic biomass and productivity are usually more alkaline(more than 100mg). The acid titrant (0.02N H2SO4) converts carbonates into bicarbonates effectively reducing pH neutrality. The reduction in pH proportional to the strength of CO2 is detected by phenolphthalein. Seasonal variation in Total alkalinity in reservoir waters is presented in Table 1 and graphically presented in Graph 1 and F. During December 2020 to November 2021 Total alkalinity range at Pimpri reservoir is 130 to 248 mg/litre with mean Total alkalinity 203.5 mg/litre, The minimum Total alkalinity is 130mg/litre in month July 2021 where as Maximum Total alkalinity is 248mg/litre was recorded at Pimpri reservoir in month March 2021.

5.Carbonate (CO3) Phenolphthalein alkalinity. Seasonal variation in Carbonate($CO3^{- -}$) Phenolphthalein alkalinityin reservoir waters is presented in Table 1 and graphically presented in Graph 1 and G. During December 2020 to November 2021 Carbonate($CO3^{- -}$) Phenolphthalein alkalinityrange at Pimpri reservoir is 4 to 28mg/litre with mean Carbonate($CO3^{- -}$) Phenolphthalein alkalinity16.83 mg/litre, The minimum Carbonate($CO3^{- -}$) Phenolphthalein alkalinityis 4mg/litre in Pimpri reservoir in month July and August 2021, whereas Maximum Carbonate($CO3^{- -}$) Phenolphthalein alkalinityis 28mg/litre was recorded at Pimpri reservoir in month February 2021.

6.Bicarbonates (HCO3) or Methyl Orange alkalinity. PH range produced by bicarbonate ions is indicated by the Methyl orange. The sample containing $HCO3^-$ when titrated against an acid (0.02N H2SO4), the quantity of acid required to reduce the pH from alkaline to acidic direction, is proportional to the strength of HCO3. Seasonal variation in Bicarbonates ($HCO3^-$) or Methyl Orange alkalinity in reservoir waters is presented in Table 1 and graphically presented in Graph 1 and H. During December 2020 to November 2021 Bicarbonates ($HCO3^-$) or Methyl Orange alkalinity range at Pimpri reservoir is 126 to 220 mg/litre with mean Bicarbonates ($HCO3^-$) or Methyl Orange alkalinity 186.5 mg/litre, The minimum Bicarbonates ($HCO3^-$) or Methyl Orange alkalinity is 126mg/litre in month July 2021, whereas Maximum Bicarbonates ($HCO3^-$) or Methyl Orange alkalinity is 220mg/litre was recorded at Pimpri reservoir in month March 2021

7.Total Hardness (mg / l). Hardness is mainly due to the presence of bicarbonates of Ca^{++} and Mg^{++} ions. It is an important parameter in detection of water pollution. Seasonal variation in Total Hardness (mg/l) in reservoir waters is presented in Table 1 and graphically presented in Graph 1 and I. During December 2020 to November 2021 Total Hardness (mg/l) in range at Pimpri reservoir is 190 to 290 mg/litre with mean Total Hardness 247.83 mg/litre, The minimum Total Hardness 190 mg/litre recorded in month August 2021 where as Maximum Total Hardness 290mg/litre was recorded at Pimpri reservoir in month July 2021

8.Calcium hardness: Seasonal variation in Calcium Hardness (mg/l) in reservoir waters is presented in Table 1 and graphically presented in Graph 1 and J. During December 2020 to November 2021 Calcium Hardness (mg/l) in range at Pimpri reservoir is 79.80 to 126 mg/litre with mean Calcium Hardness 103.42 mg/litre, The minimum Calcium Hardness 79.80 mg/litre recorded at in month September 2021 where as Maximum Calcium Hardness 126mg/litre was recorded in month May and June 2021

9. Magnesium hardness: Seasonal variation in Magnesium Hardness (mg/l) in reservoir waters is presented in Table 1 and graphically presented in Graph 1 and K. During December 2020 to November 2021 Magnesium Hardness (mg/l) in range at Pimpri reservoir is 25.86 to 49.24 mg/litre with mean Magnesium Hardness 35.03 mg/litre, The minimum Magnesium Hardness 25.86 mg/litre recorded in month August 2021 where as Maximum Magnesium Hardness 49.24mg/litre was recorded at Pimpri reservoir in month July 2021

10.Calcium Seasonal variation in Calcium (mg/l) in reservoir waters is presented in Table 1 and graphically presented in Graph 1 and L. During December 2020 to November 2021 Calcium (mg/l) in range at Pimpri reservoir is 31.98 to 50.50 mg/litre with mean Calcium 41.58 mg/litre, The minimum Calcium 31.98 mg/litre recorded in month September 2021 where as Maximum Calcium 54.50 mg/litre was recorded in month June 2021

9.Chlorides (mg/l) Seasonal variation in Chloride (mg/l) in reservoir waters is presented in Table 1 and graphically presented in Graph 1 and M. During December 2020 to November 2021 Chloride (mg/l) in range at Pimpri reservoir is 43.95 to 106.32 mg/litre with mean Chloride 66.93 mg/litre, The minimum Chloride 43.92 mg/litre recorded in month October 2021 where as Maximum Chloride 106.32 mg/litre was recorded at Pimpri reservoir in month January 2021

10.Salinity (mg/l) Seasonal variation in Salinity (mg/l) in reservoir waters is presented in Table 1 and graphically presented in Graph 1 and N. During December 2020 to November 2021 Salinity (mg/l) in range at Pimpri reservoir is 81.92 to 191.94mg/litre with mean Salinity 120.85 mg/litre, The minimum Salinity 81.92 mg/litre recorded in month October 2021 where as Maximum Salinity191.94 mg/litre was recorded at Pimpri reservoir in month January 2021

11.TDS(Total Dissolved Solids) : Seasonal variation in TDS (Total Dissolved Solids (mg /l) in reservoir waters is presented in Table 1 and graphically presented in Graph 1and O. During December 2020 to November 2021 TDS (mg/l) in range at Pimpri reservoir is 420 to 580 mg/litre with mean TDS 522.50 mg/litre, The minimum TDS 420 mg/litre recorded in month July 2021 where as Maximum TDS 580 mg/litre was recorded at Pimpri reservoir in month December 2020 and January 2021.

Regular checkup of ground water condition is effective and protective for better conservation in future ways.[4].Pollution of water reservoir reduces the quality of ground water and it's become impure form [5]. Many researchers investigated physico- chemical properties of river, lakes, dam and reservoirs. [6] to [17] and concluded that most of water resources parameters are under permissible limits.

Conclusion

Physico chemical parameters of Pimpri water reservoir were studied. for a period December 2020 to November 2021. Heavy fluctuation in oxygen concentration is noticeable factor from from this reservoir. During investigation the parameters like D.O is very less during December to June, CO_2 is very high in March, Alkalinity, Carbonate and Bicarbonate are very high during December to June, CO_2 , Total Hardness, Calcium hardness, Magnesium hardness, calcium, Chlorides salinity and TDS were high during December to June due to heavy deposition of domestic sewage in pimpri reservoir where as during july21 to November 21 all parameters are coming in normal range due to increased water level of reservoir during monsoon and thereafter up to November 2021. Physico-chemical analysis is the prime consideration to assess the quality of water for its best utilization for fisheries

Acknowledgement

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Table 1. Monthly variation of Physiochemical characteristics of Pimpri reservoir from Udgir region from Udgir region from month December 2020 to November 2021

Month	Temperature	Transperancy	pH	D.O	CO2	Total alkalinity	Carbonate	Bicarbonate	Total Hardness	Ca Hardness	Mag Hardness	Calcium	Chloride	Salinity	TDS
Dec-20	22.9	48	7.2	0.4	0.3	222	22	200	240	105	32.94	42.0	99.26	179.19	580
Jan-21	24	50	7.2	0.3	0.2	226	24	202	260	109.2	36.79	43.7	106.32	191.93	580
Feb-21	25.3	55	8.7	0.5	0.8	228	28	200	264	113.4	36.74	45.4	85.08	153.59	550
Mar-21	26.8	60	8.8	0.4	1.2	248	24	220	270	117.6	37.18	46.29	70.9	128	540
Apr-21	28.1	65	8.9	0.3	1.0	232	24	218	270	119.7	36.67	47.97	56.72	102.4	540
May-21	30.4	75	9.1	0.4	0.8	214	24	192	280	126	37.57	50.5	45.37	81.922	540
Jun-21	31.2	75	9.3	0.4	0.4	192	12	180	280	126	35.13	50.5	51.04	92.171	530
Jul-21	28	42	9.3	5.5	0.6	130	4	126	290	88.2	49.23	37.87	77.99	140.8	420
Aug-21	29	52	9.2	6.5	0.3	144	4	140	190	84	25.86	33.66	70.9	128	480
Sep-21	28	60	9.1	5.9	0.8	170	10	160	200	79.8	29.32	31.98	49.63	89.612	490
Oct-21	27	55	8.7	5.7	0.4	218	12	196	220	84	33.18	33.66	43.95	79.374	500
Nov-21	25	52	8.5	5	0.8	218	14	204	210	88.2	29.71	35.35	46.08	83.213	520
Average	27.14	57.41	8.66	2.60	0.63	203.5	16.83	186.5	247.83	103.42	35.03	41.58	66.93	120.85	522.5

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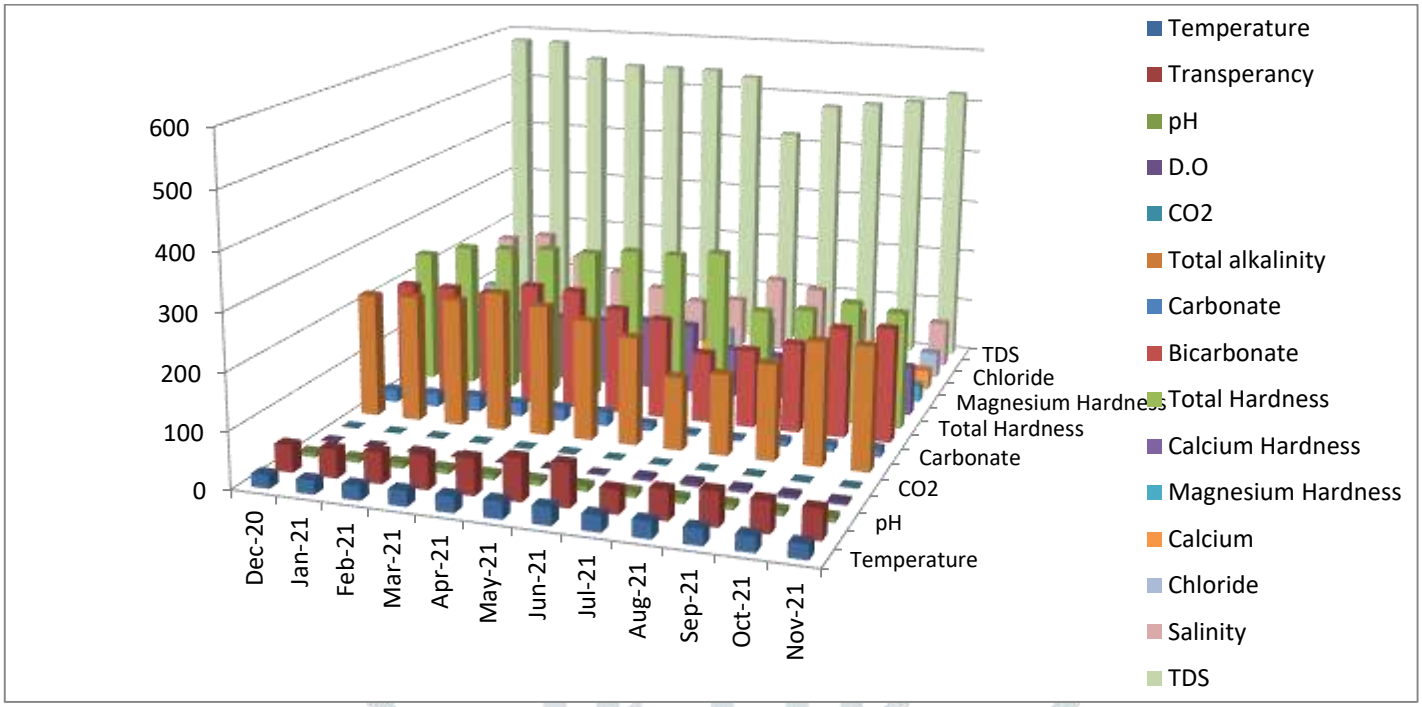
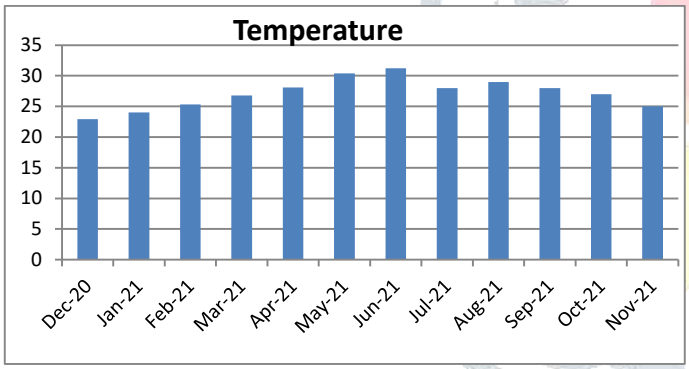


Graph 1. Monthly variation of Physiochemical characteristics of Pimpri reservoir from Udgir region from Udgir region from month December 2020 to November 2021.



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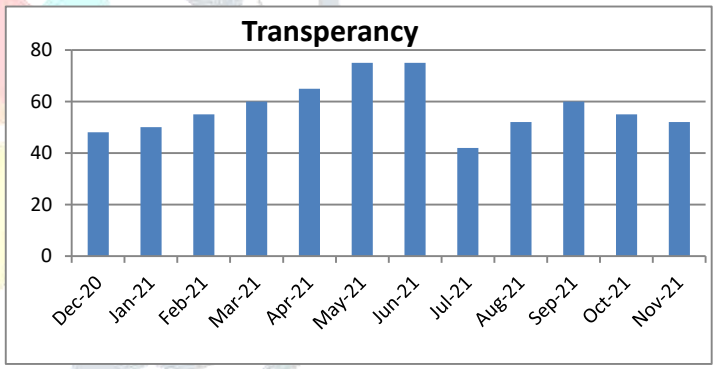

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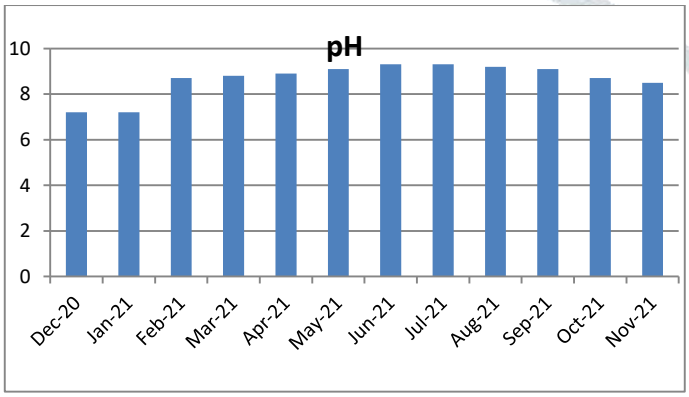

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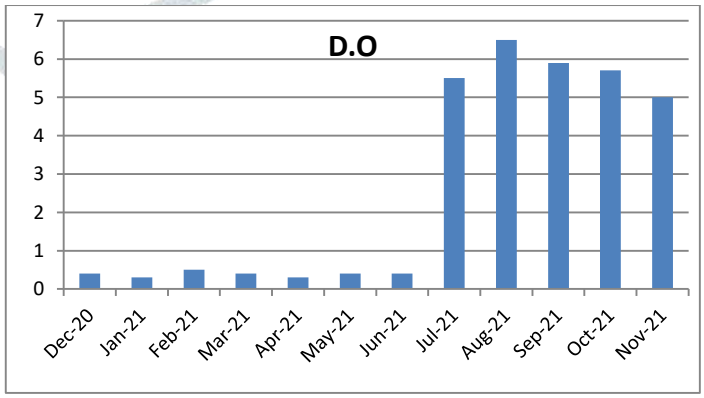

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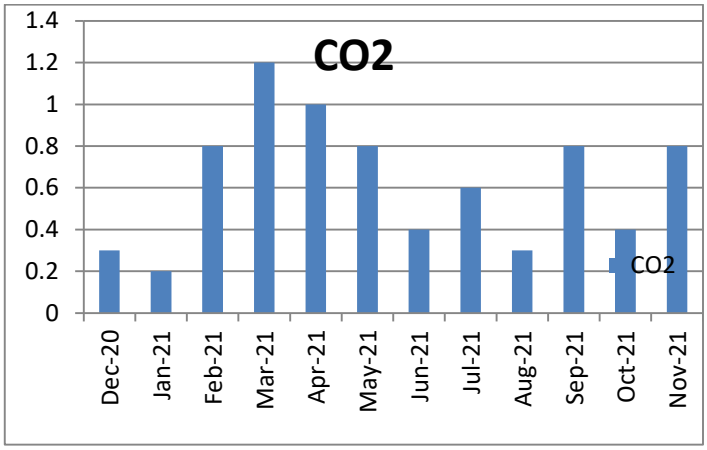
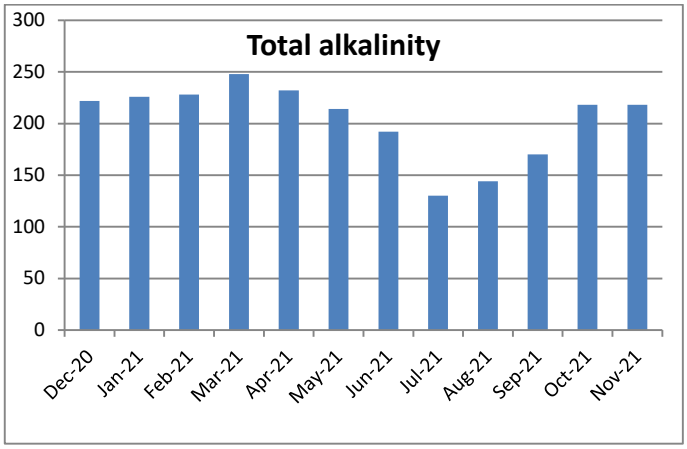
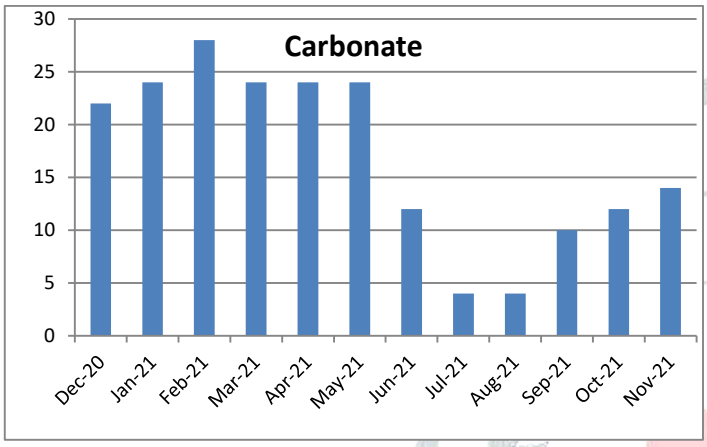

CO2
1.4
1.2
1
0.8
0.6
0.4
0.2
0
CO2
Dec-20
Jan-21
Feb-21
Mar-21
Apr-21
May-21
Jun-21
Jul-21
Aug-21
Sep-21
Oct-21
Nov-21

E


Total alkalinity
300
250
200
150
100
50
0
Dec-20
Jan-21
Feb-21
Mar-21
Apr-21
May-21
Jun-21
Jul-21
Aug-21
Sep-21
Oct-21
Nov-21

F


Carbonate
30
25
20
15
10
5
0
Dec-20
Jan-21
Feb-21
Mar-21
Apr-21
May-21
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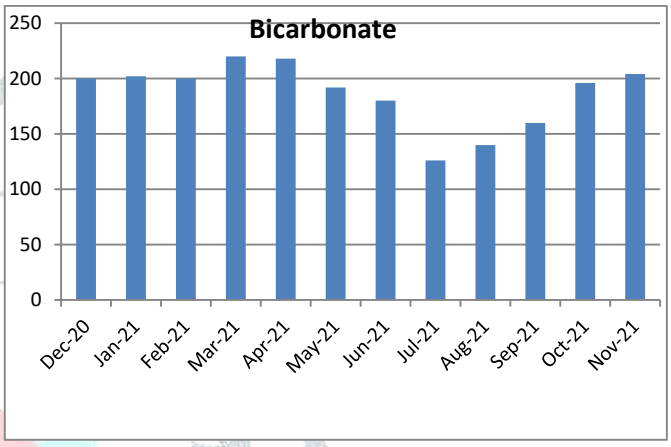
Aug-21
Sep-21
Oct-21
Nov-21

G


Bicarbonate
250
200
150
100
50
0
Dec-20
Jan-21
Feb-21
Mar-21
Apr-21
May-21
Jun-21
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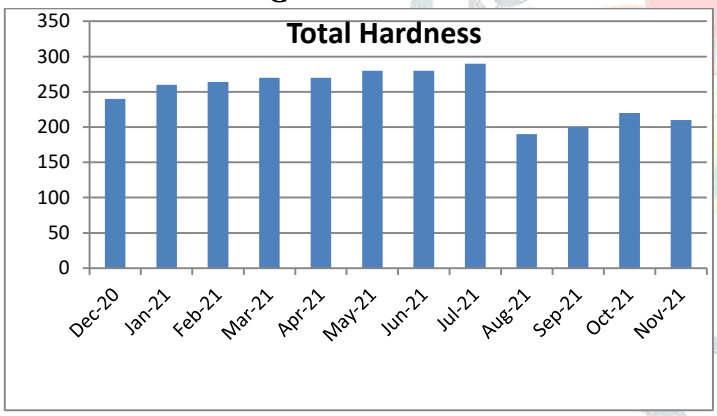
Sep-21
Oct-21
Nov-21

H


Total Hardness
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300
250
200
150
100
50
0
Dec-20
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Mar-21
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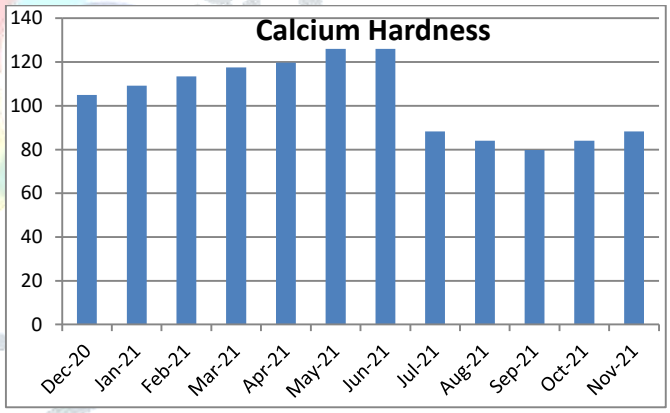
Jul-21
Aug-21
Sep-21
Oct-21
Nov-21

I


Calcium Hardness
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80
60
40
20
0
Dec-20
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Mar-21
Apr-21
May-21
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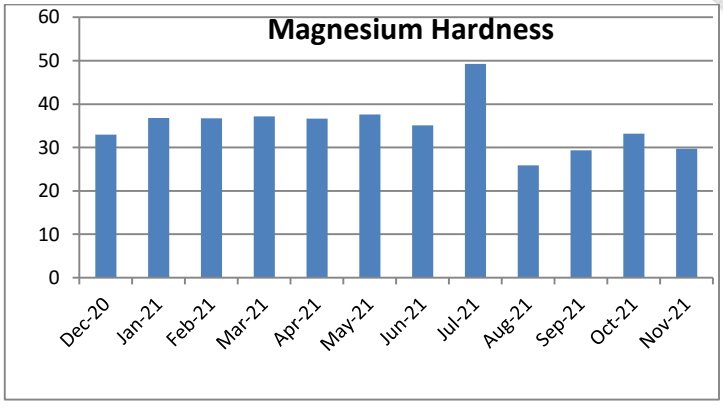
Sep-21
Oct-21
Nov-21

J


Magnesium Hardness
60
50
40
30
20
10
0
Dec-20
Jan-21
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Mar-21
Apr-21
May-21
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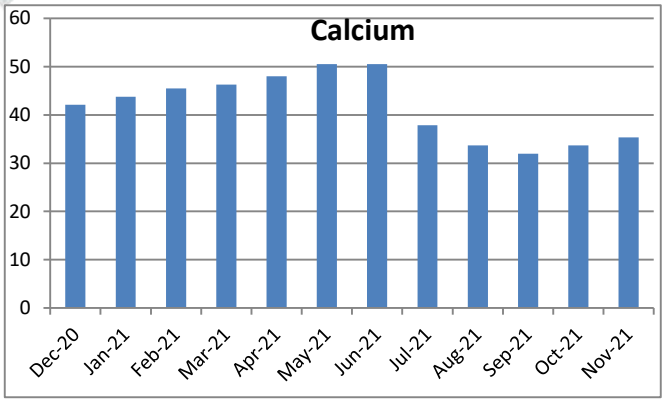
Jul-21
Aug-21
Sep-21
Oct-21
Nov-21

K


Calcium
60
50
40
30
20
10
0
Dec-20
Jan-21
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May-21
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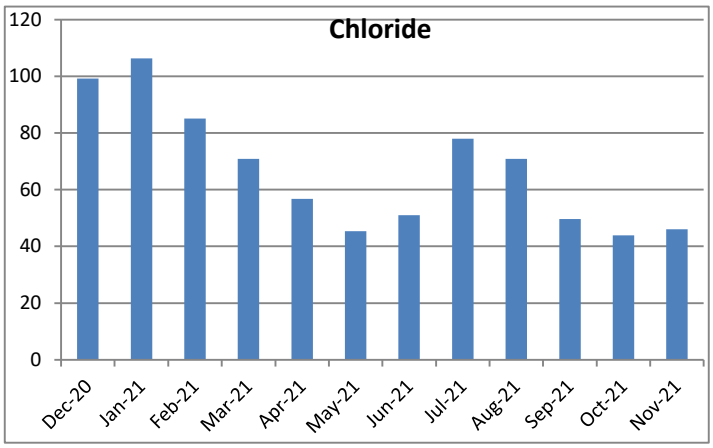
Jul-21
Aug-21
Sep-21
Oct-21
Nov-21

L



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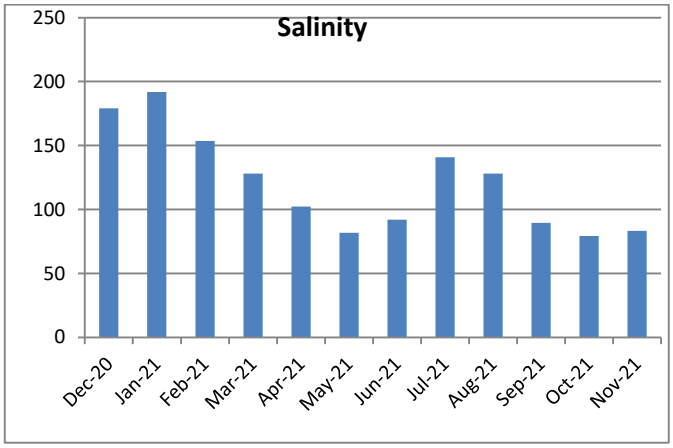

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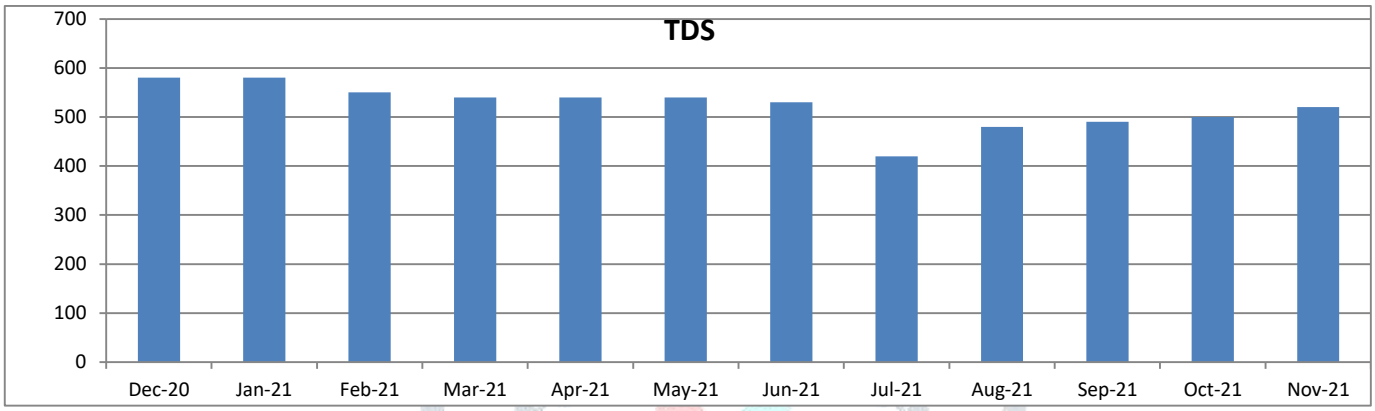

O

Graph A to O: Monthly variation of Physiochemical characteristics of Pimpri reservoir from Udgir region from month December 2020 to November 2021.

References

[1] Kodarkar *et al.* (1998)"Methodology for water analysis" by (IAAB) (Indian Association of Aquatic Biology).

[2] APHA, (1985). Standard methods for estimation of water and waste water, American public health association. American waste water association and water pollution control federation 21st Edn Washington.

[3] APHA (2005).Standard methods for the examination of water and waste water.21st Ed., D.C., U.S.A.

[4] Santra S. C.(2001) Environmental Science, New central book agency (p) Ltd., Kolkata.p-208-212.

[5] Kennedy, R.H.(1999).Reservoir design and operation: Limnological implications and management opportunities. In theoretical reservoir ecology and its applications, Ed. J.G. Tundisi and M.Straskaba,1-28.Leiden: Backhuys.

[6] Y.Shastri and D.C. pendse (2001). Hydro biological study of Dahikhuta reservoir. J.Environ.Biol.22 (1),p 67-70.

[7] Kadam M.S. and et al. (2007). Seasonal variations in different physic-chemical characteristics in Masoli reservoir of Parbhani district, Maharashtra J.Aqua. Bio.22 (1):110-112.

[8] Jayabhaye U.M, et.al.(2008).Some physic-chemical aspects of Kayadhu river,District. Hingoli. Maharashtra J.Aqua. Bio.23(1):64-68.

[9] Hujare M.S.(2008).Seasonal variations of physico-chemical parameters in the perennial tank of Talsande, Maharashtra.Ecotoxicol.Environment Monit.18(3):233-242.

[10] Salve V.B. and Hiware C.J (2008). Study on water quality of Wanparakalpa reservoir Nagpur, Near Parli Vaijinath ,District Beed, Marathwada Region.J.Aqua.Bio.21(2):113-117.

[11] Bade B.B. et al.(2009). Studies on physico-chemical parameters in Sai reservoir, Latur Dist. Maharashtra.Vol.II (7):31-34.

[12] Manjare S.A.Vhanalakar S A and Muley D.V. (2010).Analysis of water quality using physico-chemical parameter Tamdalge tank in Kolhapur district, Maharashtra.J.Adv.Biotech.and Research.1 (2):115-119.

[13] Arivoli Appavu, Sathiamoorthi Thangavelu, Satheeshkumar Muthukannan, Joseph Sahayarayan Jesudoss and Boomi Pandi (2016).STUDY OF WATER QUALITY PARAMETERS OF CAUVERY RIVER WATER IN ERODE REGION . Journal of Global Biosciences ISSN 2320-1355 Volume 5, Number 9, 2016, pp. 4556-4567

[14] Asrar Amin Khan, Nelofar Gulam Nabi, Sajad Hussain Dar, Abid Rashid, Abdul Rashid Teli and Muzamil Bashir .(2017) Seasonal variations of physico-chemical parameters in Lower Lake of Bhopal The Pharma Innovation Journal 2017; 6(11): 710-714

[15] Kumbhar A. C.(2017). Physico Chemical Parameters Of Ekrukh Water Reservoir Of North Solapur Tahsil Solapur District (M.S.). GLOBAL JOURNAL FOR RESEARCH ANALYSIS. VOL 6, ISSUE-(6), JUNE-2017 pp 224-226.

[16] Pathan A.V. (2019).Study Of Physico-Chemical Water Quality Of Tawarja Dam From Latur District (M.S.) India. Aayushi International Interdisciplinary Research Journal (AIIRJ) Vol - VI Issue - IV APRIL 2019. Pp123-125

[17] Abdulazeez Musa, Bitrus Musa Gwari, Mubarak Usman Jikantoro, Godfrey Amedu Aduku, Hamzat Abubakar Woru and Shamsudeen Mohammed .(2021).Preliminary study of some Physico-chemical parameters of Kitoro reservoir in NIFFR estate, New Bussa, Niger state. International Journal of Fisheries and Aquatic Studies 2021; 9(3): 98-101 DOI: https://doi.org/10.22271/fish.2021.v9.i3b.2478