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STUDY ON PHYSICO-CHEMICAL PARAMETERS OF POPATKHED RESERVOIR ON AKOT TAHSIL, DISTRICT AKOLA.



ABSTRACT:-

Popatkhed Reservoir is situated in Akot Tahsil, Dist Akola Maharashtra. Water sample was collected from three different sampling sites during January to December 2016. Water sample was analysed by using standard methods for Physical as well as Chemical parameters. For knowing about the water quality of analysed Physical parameters like Colour, Temperature, pH, Conductivity, Total Dissolved Solid and Chemical parameters like Dissolved Oxygen, Free Carbon dioxide, Carbonate (HCO_3), Bicarbonate (HCO_3), Total hardness, Calcium hardness, Magnesium hardness, Chloride, Phosphate. From that it was concluded that all above mentioned Physico-Chemical parameters were within the permissible limit hence the reservoir water is used for Drinking, Irrigation, Domestic use, fish cultivation.

KEYWORDS: Physico-Chemical, Popatkhed.

INTRODUCTION :

The physico-chemical parameters are very important in study of any environment, especially aquatic environment. The pH and dissolved nutrients are important for the phytoplankton production. Temperature, pH and dissolved oxygen are important factors, which control the exchange of nutrients

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between the sediment and water **Dabhade and Tandale (2016)**. The relationship between the physico-chemical parameters and plankton production of pond water and their relation with monthly fluctuation of zooplankton are of great importance and basically very much essential in care of fish culture. Fishes are more dependent on water temperature, pH, dissolved oxygen, free CO_2 , alkalinity and some other salts for growth and development. The maintenance of a healthy aquatic ecosystem is dependent on the physical-chemical properties of water and the biological diversity. A large number of streams and rivers in India have been impounded to store the water for multipurpose beneficial uses like irrigation, fisheries, power generation and drinking water supply.

The Water quality is also affected by its pollutant, which act an element existing in water such as dissolved oxygen or ammonia, nitrates. It is not possible to understand biological phenomena fully without the knowledge of water chemistry as the ecosystem. The Physico- chemical means are useful in detecting effects of pollution on the water quality but changes in trophic conditions of water are reflected in the biotic community-structure including species pattern, distribution and diversity.

MATERIAL AND METHODS:

Physico- chemical parameters analyzed as per the standard methods recommended by **Clesceri et al., (1998)** and with the help of Systronics digital portable water analysis kit, DO meter, pH meter, Conductivity meter and CST meter.



Popatkhed Reservoir Photo Showing Sampling site S1,S2,and S3 (21°20'74.76"N77°08'25.47"E)

RESULT AND DISCUSSION:

I: Physical Parameters

1. Colour:

Popatkhed Reservoirs Water Colour shows variation throughout the study period.

During month January to May it was Green Dark and in June to September it looks Olive green it might be due to monsoon during which some organic materials, sand particles are drained with flow of water. From September to December it was observed pale green might be due to plankton population increases in that season. Due to more number of phytoplankton and zooplankton water of reservoirs appears green in colour. **Sing et al., (2012)** observed colour of water was yellow brown in monsoon season, green in winter and dark green in summer season.

2. Temperature:

Temperature is major parameters for aquatic organism; during study period mean highest temperature was recorded in the month of Jun which was 28 ± 0.4 °C and lowest was observed in December was 20.03 ± 0.06 °C. There was not very significant difference in water temperature in a year. The water temperature is important factor for indicating the quality of water. It affects the aquatic organism, chemical solutes and dissolved oxygen and carbon dioxide in water.

The water temperature shows seasonal variation in change in atmospheric temperature, but in the present investigation water temperature found higher in the month of June and lower in December. The rise in water temperature in monsoon seasons due to intake of rain water. These variation of temperature in different season like decreases temperature in winter and increases in summer was reported by **Tandale et al., (2014)**, **Kumbhar et al.,(2009)**, **Bade et al.,(2009)** and **Patel (2011)**. Water Temperature shows positive correlation with pH, turbidity, T.D.S. Conductivity, Carbonate, Total hardness and magnesium hardness but it shows negative correlation with dissolved oxygen, CO₂, bicarbonate, calcium hardness in 2016.

3. pH:

pH in aquatic ecosystem indicates the alkalinity and acidity of water. During the study period mean highest pH value was observed in month of July was 7.73 ± 0.06 , lowest was in November 7.2 ± 0 . It was indicate that water pH was slightly alkaline. Most of the biological and biochemical are depends upon the fluctuations of pH, therefore pH is consider as an indicator of overall productivity that causes habitat diversity **Tandale et al., (2014)**.

pH value increases in Mansoon and pre monsoon and decreases in winter, there were found somewhat fluctuation in all results, that in some reservoir the pH found to be maximum in summer ad minimum in winter reported by **Tandale et al., (2014)**, **Dabhade and Tandale (2016)**, **Shinde et al., (2011)**.

4. Conductivity:

Conductivity is an important parameter to know the quality of water. The highest mean values of conductivity were recorded in the month of February $558.3 \pm 2 \mu\text{mhos}$ and lowest was in October $236.66 \pm 14.3 \mu\text{mhos}$. Conductivity was lower in winter season was reported by **Sing et al., (2012), Dabhade and Tandale (2016), (2017)** and Tandale and Dabhade (2014). Reservoir is partially covered with the field area therefore organic matter influence the water conductivity, in rainy season organic soil, sand particles are artificially drained, it increases the cation concentration of reservoir water studied by **Tandale et al., (2016)**.

5. Total Dissolved Solids:

Total dissolved solids is used to measure amount of particles that dissolved in water, that is nitrates, calcium, magnesium, sodium, potassium, iron, carbonates and bicarbonate **Dabhade and Tandale (2016)**.

During the Mean highest TDS value was recorded in month of July $291 \pm 3.5 \text{ mg/l}$ and Lowest was in November $219.9 \pm 10.7 \text{ mg/l}$. Due to agricultural land near the reservoir, runoff is rich and it increases the fertilizers, organic matter and salts in aquatic water, therefore the 295.6 mg/L TDS is found in July, similar result obtained by **Makode (2012)** of Charghad dam Amravati, Maharashtra. Some controversial results obtained by **Tandale et al., (2014), Verma et al., (2011)**, they found increased TDS in summer season and decreased in monsoon due to dilution of rain water.

II: Chemical Parameters

6. Dissolved Oxygen:

During the study periods mean Dissolved Oxygen from all three sampling sites highest was observed in month of January $18.3 \pm 24 \text{ mg/l}$ and lowest was in May $2.3 \pm 0.2 \text{ mg/l}$. At the time of sampling rain is on which cause the aeration hence maximum value was recorded in this particular month. Dissolved oxygen was found maximum in the month of December and January and minimum in September, October. Similar results were recorded by **Khan et al., (2012), Dabhade and Tandale (2016)**. Dissolved oxygen is play vital role in aquatic fauna, it is an important parameter for aquatic life mainly fish culture, it found lower in summer by **Rani et al., (2004) and Medudhula et al., (2012)**.

7. Carbon dioxide:

During study period free CO_2 was found nil it means that was converted in to CO_3 , or HCO_3 depends upon the pH and biological condition **Tandale et al., (2014), Dabhade and Tandale (2016), (2017)**. Presence of free CO_2 is also depends upon the time of sampling and seasonal fluctuations in water body. The total CO_2 concentration in water depend upon pH Which is governed by the buffering effect of carbonic acid, carbonate and bicarbonate **Dabhade (2015)**.

CO_2 is essential for respiratory metabolism of phytoplankton and aquatic vegetation, increased carbon dioxide level might be due to uptake from autotroph, assimilation by algae and aerobic bacteria of decay add CO_2 **Tandale et al., (2014)**.

8. CO_3 (Carbonate Phenolphthalein alkalinity):

During the study period highest mean Carbonate was found in month of April $81.4 \pm 4.6 \text{ mg/L}$ and lowest was in December $31.1 \pm 1 \text{ mg/L}$. When the value of carbonate was high on sampling sites S1 then value of Bicarbonate was low and when the Carbonate value low the Bicarbonate value high at sampling sites S2 their values are $1695 \pm 887.5 \text{ mg/l}$ and $1537.17 \pm 833.2 \text{ mg/l}$. Bicarbonates was $1284.17 \pm 554.3 \text{ mg/l}$ and $1207 \pm 505.5 \text{ mg/l}$ **Dabhade and Tandale (2016)**.

9. HCO_3 (Bicarbonate or Methyl Orange alkalinity):

During study period highest mean bicarbonate was in January $132.4 \pm 11.1 \text{ mg/land}$ lowest was in December $64.4 \pm 18.6 \text{ mg/l}$. The total value of carbonate and bicarbonate increases in summer and decreases in

the month of monsoon it may due to dilution water in rainy season and in summer less water increases the percentage of alkalinity in water body **Tandale et al., (2017), (2016)**.

10. Hardness:

Hardness of water is on the basis of both Calcium and Magnesium and we also calculated Total hardness from the summation of both calcium and magnesium hardness. Mean Total hardness highest was in March $251.7 \pm 10.1 \text{ mg/l}$ and lowest was in September $149.6 \pm 6.1 \text{ mg/l}$. Total hardness of water increases mainly due to the presence of (Ca^{2+}) and magnesium (Mg^{2+}) ions in every water body which may increase due to the human washing clothes, bathing activities in Morna reservoir **Solanke et al., (2016)**. Mean highest Magnesium was observed in February $47.1 \pm 0.1 \text{ mg/l}$ and lowest was in September $22.7 \pm 2.9 \text{ mg/l}$. The permissible limit of magnesium of drinking water is 50 mg/l according to (W.H.O).

11. Chloride:

From the chloride we are also calculated the value of salinity because for fresh water we take the chloride and for the alkaline water bodies salinity is used. During the study period chloride value of reservoir was highest $82.7 \pm 1.2 \text{ mg/l}$ observed in the month of May while lowest was in August $61.7 \pm 2.3 \text{ mg/l}$. Similar result obtained by **Shinde et al., (2011)**, according to them Higher level of chlorides in natural water is indication of pollution and domestic sewage.

12. Phosphate :

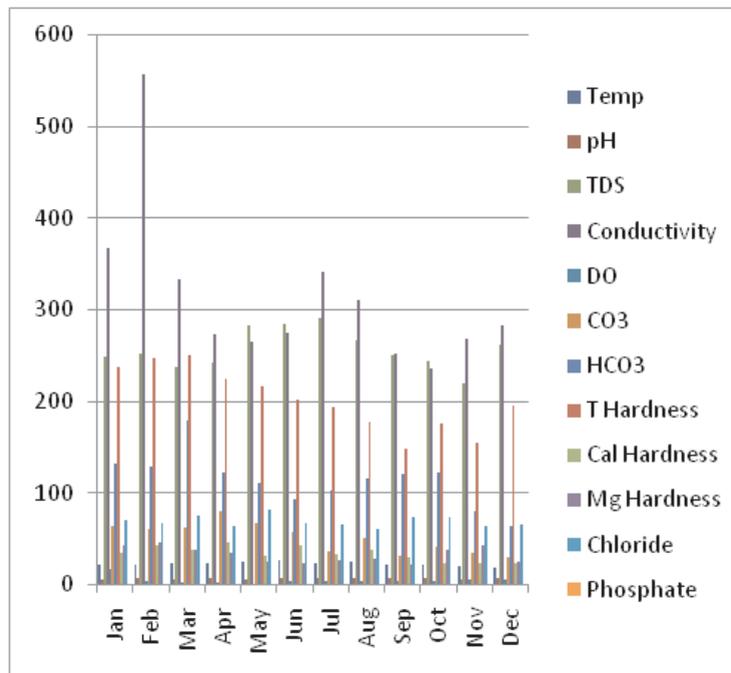
As the Popat Khed Reservoir is totally surrounded from all sides by field area and totally water in reservoir is used for irrigation purpose, therefore it is also necessary to study the phosphate level in water. Highest was observed in September $0.72 \pm 0.14 \text{ mg/l}$ and lowest in February $0.12 \pm 0.004 \text{ mg/l}$. The phosphate level was higher in Monsoon season and lower in summer and winter season **Tandale et al., (2014)**. Due to surface water runoff, agriculture run off, washer man activities increase inorganic phosphate in water in rainy season therefore phosphate level increases in monsoon season **Dabhade and Tandale (2014, 2016, 2017), Tandale and Dabhade (2014.)**

Table No. 1. Showing mean and standard deviation of Physico-Chemical Parameters of Popatkhed reservoir

Month	TEMP	pH	TDS	Conductivity	DO	CO ₃
Jan	23.5 ± 0.5	7.2 ± 0	250 ± 2	367.5 ± 12.6	18.3 ± 24	64.3 ± 0.6
Feb	23.23 ± 0.7	7.7 ± 0.1	253.7 ± 7.8	558.3 ± 167.3	4.7 ± 0.2	61.1 ± 1.9
Mar	23.73 ± 0.5	7.23 ± 0.06	237.7 ± 2.9	333.7 ± 12.8	3.4 ± 0	62.6 ± 0.8
Apr	25.03 ± 0.1	7.3 ± 0.1	243.3 ± 2.3	274.2 ± 16.8	2.8 ± 0	81.4 ± 4.6
May	26.4 ± 0.67	7.22 ± 0.03	283.2 ± 3.5	266.2 ± 12.6	2.3 ± 0.2	67.6 ± 3.9
Jun	28 ± 0.4	7.5 ± 0.05	285 ± 4.3	275.1 ± 27.6	4.7 ± 0.25	58.2 ± 8.6
Jul	24.5 ± 0.5	7.73 ± 0.06	292 ± 3.5	342.8 ± 20.6	5.4 ± 0.3	38 ± 6
Aug	25.3 ± 0.23	7.51 ± 0.17	267.3 ± 10	310.6 ± 37.6	5.5 ± 0.5	52.7 ± 5.03
Sept	23.03 ± 0.1	7.4 ± 0.06	252 ± 11.6	252.5 ± 6.5	4.2 ± 0.0	31.7 ± 6.3
Oct	22.8 ± 0.35	7.6 ± 0.2	245.1 ± 4.7	236.66 ± 14.3	4.8 ± 0.5	41.5 ± 2.7
Nov	21.23 ± 0.2	7.2 ± 0	219.9 ± 11	269.6 ± 2.5	6.3 ± 0.21	35.7 ± 1.5
Dec	20.03 ± 0.1	7.32 ± 0.01	263 ± 23.6	283.9 ± 61.3	6.1 ± 1.6	31.1 ± 1

Table No. 2. Showing mean and standard deviation of Physico-Chemical Parameters of Popatkhed reservoir

Month	HCO ₃	T. Hard	Ca Hard	Mg Hard	Chloride	Phosphate
Jan	132.4±11.1	238.7±1.2	36.3±3.6	43.9±4.8	70.7±2.3	0.15±0.03
Feb	129.2±8.47	248.3±10.7	44.2±3.7	47.1±0.1	68±0	0.12±0.004
Mar	179.37±11.7	251.7±10.1	39.3±2.3	39.3±2.3	76.7±8.0	0.21±0.01
Apr	123.3±2.9	225.3±6.4	47.3±0.6	36±0	65.7±0.6	0.3±0.03
May	112.7±11.01	217±11	32.7±1.2	25.7±1.2	82.7±1.2	0.28±0.02
Jun	94.8±11.5	202±13	43±1.7	24.3±0.6	68.7±9	0.29±0.02
Jul	103.2±4.4	195.3±5.03	33.7±6.7	27.3±9.02	66.7±10.8	0.62±0.4
Aug	116.0±3.7	178.7±6.1	38.7±3.1	29±6.1	61.7±2.3	0.33±0.12
Sept	121.4±3.2	149±6.1	30.7±2.3	22.7±2.9	75.3±3.1	0.72±0.14
Oct	122.5±3.9	177.3±12.7	24.3±0.6	38.7±2.5	74.7±14.2	0.38±0.1
Nov	80.5±13.3	156.3±13.2	23.7±6.4	43±1.7	64.3±10	0.6±0.1
Dec	64.4±18.6	196±10.8	24.7±0.6	26±2	66±7.2	0.53±0.2

**Graphical Presentation of Physico-Chemical Parameters during Study Period****CONCLUSION:**

Popatkhed reservoir shows seasonal fluctuations in Physico-Chemical parameters which affect the aquatic organism that may zooplankton or phytoplankton and or micro-invertebrates. Therefore it is necessary to analysed such parameters for better utilization of water because it was used for Drinking, irrigation, purpose hence guideline should be provided to local people for maintaining the water quality of reservoir.

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