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Study of physico-chemical parameter for a reservoir at Khandwa District (M.P.)

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Abstract

Importance of water for the living being could not be neglected, with this view and the impact of the reservoir from the ecological and local point, this study was carried out. Reservoir studied is located at Khandwa, 3 Km. away from city, Khandwa on a local nallha named Barood nallah. It is a rain water reservoir, the primary source of water to the reservoir is a 6.4 Km long canal called Ajanti canal. Analysis of the reservoir water is carried out to observe the effect of decreasing catchment's area, due to siltation and decreasing water quantity on the physico-chemical condition of the reservoir water and its seasonal variation. Physico-chemical parameter analyzed were; temperature, pH, turbidity, transparency, TDS, silicate, free CO, DO, BOD, COD, total hardness, Ca hardness, Mg hardness, sulphate, fluoride, chloride and potassium form August 2006 July2007. Statistical analysis of the obtained data is carried out to draw conclusion.

Introduction

Water plays a significant role in different vital and structural activities. Water is inevitable for all living organisms as it has a great social and economical value ultimately affecting men health. It is essentially required for irrigation, industrial development, hydro electrical generations, fisheries, human life survival and domesticated animals. As the water is very important reservoirs have multidimentional approach including flood control, hydropower generation, water supply, navigation, restoration, etc (Ngo, 2006). Moghat reservoir is a tropical rain water reservoir located in Khandwa district, near Moghat village, 3 Km away from the Khandwa city. It was constructed in 1897 by the British engineers, initially to full fill the water requirement of the Khandwa city. Catchment area of the reservoir was 23.30 square kilometer and to this water is added by local nala named Ajanti canal and seasonal river, but now it has been reduced greatly due to natural and anthropogenic activity. With the time and due to improper management water holding capacity of the reservoir decreased and ultimately failed to complete the motive for which this reservoir came into existence. Till now no such limnological study has been carried out on the Moghat reservoir therefore no review on this reservoir was found. Limnological study on pond and other reservoir is carried out like Adefemi, O.S. et al., (2007) worked on the physico-chemical condition of a dam in Nigeria and showed the level of significance between different physico-chemical state-variable. Limnological features of man made lakes were analysed and observed by Avoade, et al. (2006). Polak, J. studied the nitrifying activities in Wloclawek dam reservoir in 2004. Van Den Bos, A.C. in 2003 released his work on the water quality of the Occoquan reservoir and its tributary watershed. Daily physico-chemical dynamics of Siemianowka reservoir lies in northeastern Poland was studied by Jekatierynczuk-Rudczyk, E., et al. (2002). Khanna, et al. (2000) analyzed the abiotic factors of a pond at hardwar.

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Purpose of this study :

i. the present water reservoir is not studied so far.

ii. conduct and update water quality assessment of the Moghat reservoir.

iii. assess the present physical and physico-chemical status of reservoir.

iv. draw attention towards the problem faced by the reservoir.

Materials and Method

Study site

Moghat reservoir is located 3 kilometer away from the Khandwa city in northwest. The geographic position of this reservoir is 21 - 49° N and 76 - 20° E. It is situated 1071 ft. above from mean sea level. The maximum depth 5.2 m. and mean depth 1.2 m. it has 5.36 kilometer long shoreline. Source of water to the reservoir is a canal named Ajanti canal which collect rain water from various sources and drain it to the reservoir. Since the time human activity near by to the reservoir increased problem of eutrophication and siltation to the reservoir increased.

Sampling

Monthly sampling was done from July 2006 to August 2007. Samples were taken between 7 am. to 9 am. but transparency was measured between 10 am. to 2 pm. Water samples were taken on one liter polythene bottles. Temperature, pH, fixing of DO and transparency were measured at the spot.

Analysis

Samples were analyzed according to "Standard Methods for the Examination of Water and Wastewater (APHA)" 20th edition; 1998. Published by American Public Health Association.

Results and Discussion

In the investigated physical trait of the reservoir water it is observed that water temperature was maximum during July (29.63 $^{\circ}$ C ±0.29) and minimum during December (17.93 $^{\circ}$ C ±0.19), transparency was maximum in December (8.98 cm ±3.10) and minimum in September (1.52 cm ±0.99), turbidity in August was maximum (138 JTU±26.95) and minimum during the month of January (22.75 JTU±3.86) and TDS maximum in the month of July (218 mg/19.42) and minimum during February (105.80 mg/1±2.20). Average observed for Temperature, Transparency, Turbidity and TDS for the year 2006-07 were 25.69 $^{\circ}$ C ±4.27, 5.15 cm ±3.63, 68.04 JTU±39.39, 166.81±33.60 mg/l respectively. Observations of physical parameter are given in table no.1. Chemical parameter analyzed for reservoir water were pH, Free CO₂, Total hardness, Ca hardness, Mg hardness, DO, BOD, COD, Sulphate, Floride, Silicate, Potassium and Chloride. Observed values are given in table no-2. The maximum and minimum value for pH was (8.82±0.02) in January and (7.72±0.17) in August respectively. Free CO, was maximum (3.63 mg/1±0.83) in May and minimum (1.22 mg/1±0.08) in October, Ca

(128) Environment Conservation Journal and Mg hardness found in the reservoir water maximum was $(37.25 \text{ mg}/1\pm1.76)$ in June and $(26.05 \text{ mg}/1\pm1.69)$ in June respectively and the minimum value of them was $(26.90 \text{ mg}/1\pm0.82)$ in February and $(11.08 \text{ mg}/1\pm1.29)$ in November respectively. Total hardness found was maximum $(154.33 \text{ mg}/1\pm1.85)$ in May $(92.83 \text{ mg}/1\pm0.70)$ in September. Minimum and maximum value of DO found was $(4.98 \text{ mg}/1\pm0.61)$ in April and $(8.90 \text{ mg}/1\pm0.22)$ in December respectively. The minimum value of BOD found for the reservoir water was $(2.93 \text{ mg}/1\pm0.15)$ in December and maximum value was $(4.73 \text{ mg}/1\pm0.35)$ in June. COD observed was $(8.73 \text{ mg}/1\pm0.65)$ in November and minimum was $(11.73 \text{ mg}/1\pm0.46)$ in June. The minimum value of Sulphate, Silicate Potassium and Chloride was $(16.03 \text{ mg}/1\pm1.07)$ in December, $(6.75 \text{ mg}/1\pm0.17)$ in November, $(0.97 \text{ mg}/1\pm0.01)$ in August, $(17.13 \text{ mg}/1\pm2.16)$ in December respectively. The maximum value observed for the reservoir water for the parameter Sulphate, Silicate, Potassium and Chloride was $(33.65 \text{ mg}/1\pm1.65)$ in July, $(11.20 \text{ mg}/1\pm0.28)$ in April, $(1.28 \text{ mg}/1\pm0.03)$ in June, $(32.30 \text{ mg}/1\pm2.10)$ in June respectively. Fluoride during the whole show no variation and its value found constant $(0.30 \text{ mg}/1\pm0.00)$.

The average value during the whole year of study observed for pH, Free CO_2 , Total hardness, Ca hardness, Mg hardness, DO, BOD, COD, Sulphate, Fluoride, Silicate, Potassium and Chloride was (8.18±0.20), (2.40 mg/1±0.78), (121.64 mg/1±19.23), (29.95 mg/1±3.53), (15.91 mg/1±4.98), (6.64 mg/1±1.37), (3.77 mg/1±0.59), (10.41 mg/1±1.00), (23.66 mg/1±5.97), (0.30 mg/1±5.8E-17), (1.17 mg/1±0.09), (23.13 mg/1±4.88) respectively. Results obtained are given in tabular form in table no.1 & 2 and their graphical representation are shown in fig. no. 5 to 8.

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<u>Moghat reservoir</u>

<u>Ajanti canal</u>





Siltation effect on Moghat reservoir

Eutrophication in Moghat reservoir

Table No.1: Seasonal variation in physical parameter of Moghat reservoir water for 2006-2007.

Months	Temperature (⁰ C)	Transparency (cm)	Turbidity (JTU)	TDS (mg/l)
July	29.63±0.29	3.88±0.83	120.25±14.38	218.00±9.42
August	26.95±0.13	1.80±0.55	138.50±26.95	190.50±3.70
September	28.63±1.1	1.52±0.99	41.50±11.50	180.00±7.35
October	29.65±0.24	7.77±2.72	38.75±8.50	174.00±6.32
November	21.50±0.48	8.68±1.22	25.25±4.11	169.75±7.90
December	17.93±0.19	8.90±3.10	30.50±8.02	163.50±7.77
January	19.35±1.4	7.23±1.57	22.75±3.86	128.50±1.73
February	22.53±0.48	6.28±1.76	48.25±15.12	105.80±2.20
March	25.68±0.51	5.84±1.34	71.75±22.29	129.35±0.47
April	27.80±0.18	3.19±1.46	84.75±10.24	149.83±1.46
May	29.50±0.57	3.76±0.91	88.50±6.66	182.50±7.55
June	29.20±0.78	2.98±1.03	105.75±11.32	210.00±12.49
Average±Sd	25.69±4.27	5.15±2.63	68.04±39.39	166.81±33.60

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Month Co. (mg) <th></th> <th>ЪН</th> <th>Free</th> <th></th> <th>Hardness</th> <th></th> <th>DO</th> <th>BOD</th> <th>COD</th> <th>Sulphate</th> <th>Fluoride</th> <th>Silicate</th> <th>Potassium</th> <th>Chlorid</th>		ЪН	Free		Hardness		DO	BOD	COD	Sulphate	Fluoride	Silicate	Potassium	Chlorid
model model <t< th=""><th>Months</th><th></th><th>co_2</th><th></th><th>(mg/l)</th><th></th><th>(mg/l)</th><th>(mg/l)</th><th>(mg/l)</th><th>(l/gm)</th><th>(l/gm)</th><th>(Ilgm)</th><th>(mg/l)</th><th>(mg/l)</th></t<>	Months		co_2		(mg/l)		(mg/l)	(mg/l)	(mg/l)	(l/gm)	(l/gm)	(Ilgm)	(mg/l)	(mg/l)
July 7840.3 2740.46 $10.4641.7$ 23284.16 $12.3641.6$ $0.3660.7$ $3.6641.65$ 0.3000 $3.8664.65$ 10.0002 23344.65 August $1.7220.17$ $2.920.08$ 26841.30 27481.30 $11.992.217$ $5.700.22$ 4180.77 $0.5660.79$ 3100.0128 $0.3800.9$ $100-010$ 23344.65 September $8.12-06$ $2.28-0.76$ 27841.30 $12.78-134$ $12.79-232$ $6.43-0.25$ $8.860.66$ $0.1800.71$ $2.56-1.77$ $0.300.00$ $210-0.56$ $127-0.19$ 21344.64 November $8.27-0.06$ $12.28-0.76$ $12.78-1.36$ $12.79-1.34$ $12.79-1.34$ $12.79-1.34$ $12.79-1.34$ $12.79-1.34$ November $8.23-0.06$ $118.28-0.78$ $12.78-1.36$ $12.79-1.34$ $12.79-1.34$ $12.79-1.34$ $12.79-1.34$ $12.79-1.34$ $12.79-1.34$ November $8.23-0.66$ $118.28-0.78$ $10.89-0.72$ $2.78-0.75$ $1.88-0.67$ $1.88-1.54$ $1.71-2.64$ November $8.23-0.66$ $12.79-0.36$ $11.06-1.20$ $2.78-0.75$ $1.88-1.34$ $1.71-2.64$ $1.71-2.64$ January $8.82-0.66$ $12.79-0.36$ $11.88-1.36$ $8.82-0.67$ $1.88-1.36$ $1.88-1.36$ $1.12-0.36$ $1.11-2.006$ $2.12-0.04$ $1.12-0.06$ $1.12-0.04$ January $8.82-0.66$ $12.79-0.36$ $11.88-1.36$ $8.88-1.06$ $6.79-0.76$ $1.88-1.36$ $1.71-2.60.76$ $1.11-2.006$ $1.12-0.06$ $1.12-0.06$ $1.12-0.06$ $1.12-0.06$ Ja			(mg/l)	Total	Са	Mg								
Algest $7.7a.01$ $2.9a.08$ $6.3a.1.0$ $2.7a.1.3$ $2.7a.1.3$ $2.7a.1.3$ $2.3a.0.6$ $0.1ba.0.7$ $3.0.1ba.0.7$ $0.1ba.0.7$ 0.1	July	7.84±0.25	2.74±0.54	104.45±1.72	29.35±1.80	12.30±1.43	5.50±0.29	4.50±0.56	11.48±0.68	33.65±1.65	0°30±00	9.88±0.50	1.00±0.02	28.95±4.14
September $$1240.0$ $$2594.07$ $$2584.07$ $$124.64.07$ $$123.64.07$	August	7.72±0.17	2.92±0.95	96.38±1.50	27.43±1.30	11.93±2.17	5.70±0.32	4.18±0.71	10.65±0.79	30.10±0.28	0.30±00	9.10±0.56	10.0±72.0	23.33±4.66
October 3.73 ± 0.0 2.23 ± 1.0 12.54 ± 1.0 3.73 ± 0.54 12.84 ± 0.54	September	8.12±0.08	2.59±0.98	92.83±0.70	27.88±1.84	12.07±2.32	6.43±0.29	3.85±0.66	10.18±0.71	25.45±1.77	0.30±00	8.33±0.34	1.20±0.03	22.05±3.64
Nwember 53H-0.0c 28H-0.0c 18.38-0.9c 11.88-0.9c 11.84-0.0c 11.84-0.0c <th>October</th> <td>8.27±0.00</td> <td>2.22±1.02</td> <td>122.45±1.07</td> <td>28.78±1.68</td> <td>12.73±1.34</td> <td>6.48±0.43</td> <td>3.28±0.28</td> <td>9.48±0.50</td> <td>22.65±1.31</td> <td>0.30±00</td> <td>7.38±0.26</td> <td>1.23±0.04</td> <td>18.85±1.53</td>	October	8.27±0.00	2.22±1.02	122.45±1.07	28.78±1.68	12.73±1.34	6.48±0.43	3.28±0.28	9.48±0.50	22.65±1.31	0.30±00	7.38±0.26	1.23±0.04	18.85±1.53
December $\delta 2^{3} - 0.6$ $12^{3} - 0.6$ $23^{3} - 0.5$ $14^{3} - 0$	November	8.24±0.00	2.81±0.7%	118.28±0.98	28.33±0.92	11.08±1.29	6.43±0.17	3.13±0.21	8.73±0.65	22.60±1.97	0.30±00	6.75±0.17	1.23±0.05	17.15±1.33
January 8.82-0.0 1.57-0.0 121.90-2.27 27.45-1.6 14.55-1.6 3.86-0.7 5.86-0.67 0.30-00 7.87-0.13 115-6.04 1056-5.51 February 8.22-0.66 1.58-0.16 12.38-1.11 25.96-0.67 1.58-0.15 0.30-00 7.88-0.67 0.30-00 7.88-0.67 1.15-6.04 1056-3.51 March 8.22-0.66 1.23-0.67 1.23-0.67 1.23-0.67 1.23-0.67 0.30-00 2.58-0.28 1.17-6.05 2.30-3.45 March 8.32-0.66 1.27-0.67 1.23-0.15 6.63-0.61 3.73-0.15 10.90-0.27 10.30-0.67 10.30-0.23 1.21-0.05 2.36-4.50 March 8.32-0.66 1.37-0.16 1.45-0.15 6.63-0.61 3.73-0.15 10.90-0.27 10.30-0.67 10.30-0.23 1.21-0.05 2.36-4.50 2.56-4.50 2.56-4.50 2.56-4.50 2.56-4.50 2.56-4.50 2.56-4.50 2.56-4.50 2.56-4.50 2.56-4.50 2.56-4.50 2.56-4.50 2.56-4.50 2.56-4.50 2.56-4.50 2.56-4.50 2.56-4.50 2.56-4.50	December	8.23±0.08	1.22±0.08	120.48±0.93	27.50±0.75	14.25±1.44	8.90±0.22	293±0.15	8.98±1.10	16.03±1.07	0.30±00	7.23±0.24	1.15±0.03	17.13±2.16
February 8.22-0.05 1.28-0.19 1.28-0.10 1.28-0.10 1.28-0.10 1.28-0.10 1.28-0.10 1.28-0.10 2.38-0.35 1.17-0.05 2.13-0.05 2.33-0.35 2.34-0.35 2.56-0.35 <th< th=""><th>January</th><td>8.82±0.02</td><td>1.37 ± 0.20</td><td>121.50±2.27</td><td>27.43±1.03</td><td>14.53±1.31</td><td>8.25±0.31</td><td>3.18±0.15</td><td>9.83±0.40</td><td>16.78±0.87</td><td>0.30±00</td><td>7.83±0.13</td><td>1.15±0.04</td><td>19.05±3.51</td></th<>	January	8.82±0.02	1.37 ± 0.20	121.50±2.27	27.43±1.03	14.53±1.31	8.25±0.31	3.18±0.15	9.83±0.40	16.78±0.87	0.30±00	7.83±0.13	1.15±0.04	19.05±3.51
March 8.23-0.06 1.27.0e1.78 255-0.07 1.679-1.25 6.63-0.61 3.73-0.15 10.0e.0.27 19.28-0.46 0.31-0.07 10.31-0.23 12.31-0.05 255-04.36 April 8.37-0.16 2.33-0.08 13.05-1.26 6.63-0.07 0.63-0.05 10.09-0.02 0.31-0.07 10.31-0.03 1.23-0.03 25.60-13.0 May 8.34-0.16 3.63-0.08 13.05-1.36 2.458-1.36 4.58-0.61 4.28-0.25 11.40-0.38 2.73-0.08 1.23-0.03 1.23-0.03 2.56-01.30 May 8.34-0.16 3.63-0.08 154.32-1.66 2.488-1.48 4.98-0.61 4.28-0.25 11.40-0.38 2.73-0.08 0.30-0.0 10.20-0.33 1.23-0.03 2.56-0.13 May 8.34-0.16 3.63-0.18 3.64-1.36 4.38-0.16 4.38-0.25 11.40-0.38 2.73-0.08 0.30-0.0 10.20-0.23 2.56-0.13 2.56+1.30 June 8.28-0.06 13.64-1.76 3.14-0.26 2.14-0.26 3.16-1.42 0.30-0.0 10.64-0.27 1.56+1.70 June 8.28-0.0	February	8.22±0.08	1.38±0.19	122.38±1.11	26.90±0.82	16.28±1.47	7.70±0.71	3.45±0.13	10.43±0.25	17.68±0.67	0.30±00	9.58±0.28	1.17±0.05	21.30±3.45
April 3.7%4.0.6 2.8%4.0.6 1.4.8%4.1.6 3.5%4.0.7 1.6%4.0.2 10.9%0.0.2 0.3%4.0.2 1.2%4.0.3 1.2%4.0.3 2.6644.30 May 8.3%4.0.6 1.3%4.0.6 1.3%4.0.6 1.3%4.0.7 1.3%4.0.8 1.3%4.0.3 1.2%4.0.3 2.6644.30 2.6644.30 May 8.3%4.0.6 1.3%4.0.6 4.3%4.0.6 4.2%4.0.6 4.3%4.0.6 1.3%4.0.8 1.3%4.0.8 1.2%4.0.3 2.6644.30 2.6644.30 2.6644.30 2.844.30 1.3%4.0.6 1.2%4.0.7 1.2%4.0.8 2.6644.30 2.6644.30 2.6644.30 2.844.30 2.844.30 2.844.30 2.844.30 2.844.30 2.644.30 2.644.30 2.844.30<	March	8.32±0.06	1.92±0.69	127.10±1.78	29.55±0.70	16.79±1.25	6.63±0.61	3.73±0.15	10.90±0.27	19.28±0.46	0.30±00	10.30±0.23	1.21±0.05	23.58±4.30
May 8.34=0.0 3.66=0.03 154.32±1.55 54.08=1.46 4.58=0.05 4.58=0.05 12.54=0.02 12.54=0.02 25.64±1.70 June 8.28=0.05 135.64±1.70 37.24±1.56 24.98=1.46 4.58=0.05 4.58=0.12 12.64±0.02 12.54=0.02 25.64±1.70 25.64±1	April	8.37±0.16	2.81 ± 0.83	134.85±1.61	32.98±1.40	18.05±1.26	5.55±0.37	4.05±0.26	10.90±0.29	20.78±0.82	0.30±00	11.20±0.28	1.23 ± 0.03	25.64±3.50
June 8.28±0.6 153.64±1.0 37.24±1.6 5.13±0.45 4.73±0.55 11.73±0.46 31.64±1.42 0.30±0.0 10.66±0.52 1.28±0.05 2.23±20.17 Averagetsd 8.18±0.30 2.37±0.55 11.51±0.46 31.64±1.42 0.30±0.00 10.66±0.52 1.28±0.05 2.23±20.17 Averagetsd 8.18±0.30 2.37±0.55 15.91±0.46 5.66±1.37 3.77±0.59 10.41±1.00 23.66±5.97 0.30±5.62±17 9.08±1.54 11.7±0.09 23.13±4.88	May	8.34±0.04	3.63±0.83	154.33±1.85	36.10±1.56	24.98±1.48	4.98±0.61	4.28±0.22	11.40±0.28	27.33±0.98	0.30±00	10.83±0.15	1.25±0.02	25.64±1.70
Average/sd 8.18:0.0 2.57:0.5 121.64:18.01 29.95:3.55 15.91:4.08 6.64:137 3.77:0.59 10.41:1.00 23.66:5.97 0.30:5.87:17 308:1.54 1.17:0.09 23.13:4.88	June	8.28±0.06	2.79±0.60	153.65±1.70	37.25±1.76	26.05±1.69	5.13±0.43	4.73±0.35	11.73±0.46	31.63±1.42	0.30±00	10.60±0.52	1.28±0.03	32.30±2017
	Average±Sd	8.18±0.20	2.37±0.75	121.64±18.01	29.95±3.53	15.91±4.98	6.64±1.37	3.77±0.59	10.41±1.00	23.66±5.97	0.30±5.8E-17	9.08±1.54	1.17±0.09	23.13±4.88

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Fig.5: Variation between Turbidity, Total hardness, Ca hardness and Mg hardness



Fig.6: Comparision between Free CO2, DO, BOD and COD



Fig.7: Comparative study between Ca, Mg, DO, Sulphate, Floride, Potassium and Chloride



Fig.8: Comparative study between Temperature, Free CO2, DO, Floride and Chloride



