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WATER QUALITY STATUS OF MAHAGAON RESERVOIR FROM GADHINGLAJ TAHSIL FROM MAHARASHTRA.

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Abstract: The present study deals with the water quality of Mahagaon reservoir of Gadhinglaj tahsil, Maharashtra. Monthly changes in physico-chemical parameters were analyzed for a period of one year from July 2009 to June 2010.Variables analyzed from surface water of the reservoir are water temperature, transparency, turbidity, pH, EC, free CO_2,total alkalinity, total hardness, calcium, magnesium, chlorides, total dissolved solids, total nitrogen, total phosphorus, dissolved oxygen and biochemical oxygen demand. On an average the highest concentration of electrical conductivity, pH, hardness, alkalinity, chloride and total dissolved solids were observed in summer season and lower concentrations in rainy season. The fluctuating levels were found throughout the year. The physico-chemical parameters of the water were compared with WHO (1984) standards and all the values were within the permissible limit. The water of this reservoir is suitable for domestic as well as drinking purpose.
Keywords: Freshwater, physico-chemical parameters, monthly variations, potability, water quality.

Introduction

The freshwater reservoir is located at south of Gadhinglaj tehsil with Longitude and latitude of N 16^0 07' 28" and E 74^0 21' 15" respectively. The reservoir is constructed in the year 2003. Area covered by reservoir is 4.65 ha. The length and height of the dam is 260 m and 15.40 m respectively. It is used for drinking and fishing purpose.

Materials and methods

Collection of samples:

The samples of surface water were collected monthly from Mahagaon reservoir during July 2009 to June 2010. The samples were collected in plastic container in the morning hours and brought to the laboratory for further analysis. The analysis was carried out within 12 hours.

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Analysis of physico-chemical properties:

Standard methods were used. Some parameters like Temperature, pH, Transparency was done at the investigation sites. The sample for DO was fixed in the BOD bottle at the sites and then brought to the Laboratory for analysis. Winkler's method was followed for this analysis, while remaining analysis was made by the standard methods of APHA (2005) and Trivedy and Goel (1984).

Results and Discussion:

Samples were collected from two sites monthly in triplicate. Minimum, maximum, average and standard deviation of physico-chemical parameters of the Mahagaon reservoir are represented in table I

Temperature:

Atmospheric and water temperature both play an important role in the physico-chemical and physiological behavior of the aquatic system. It also exerts profound direct or indirect influence on metabolic and physiological behavior of aquatic ecosystem (Welch, 1952). Monthly variation in atmospheric and water temperature ranges from 24.03^{0}C to 39.3 ^{0}C, with an average of 29.11 ^{0}C and 22.01 ^{0}C to 30.03 ^{0}C with an average of 25.09 ^{0}C respectively. The atmospheric temperature was minimum in the month of December while maximum in the month of April whereas water temperature was minimum in the month of January while maximum in the month of April.

Transparency:

Transparency is a characteristic of water that varies with the combined effect of color and turbidity. It is universally proportional to the turbidity which intern is directly proportional to the amount of suspended organic and inorganic matter. The monthly variation in transparency ranges between 32.5 cm to 62 cm, with an average of 45.06 cm. It was recorded maximum in the month of November and minimum in the month of July. The lower transparency during rainy season might be due to silt brought into the reservoir and higher transparency during the winter season due to gradual settlement of silt. Similar trend has given by Ranjan *et al.* (2007).

Turbidity:

Turbidity is the suspension of particles such as clay, silt and organic matter. The monthly variation in turbidity ranges from 3.56 NTU to 42.11 NTU, with an average values 12.11 NTU. Maximum value was observed in the month of July while minimum during October. During rainy season silt, clay and suspended particles contribute to the turbidity

values while during winter season settlement of silt, clay and suspended particles resulting low turbidity. High turbidity during rainy season has been reported by Garg *et al.* (2006) and Nikam *et al.* (2011).

pH:

pH is an important indicator which indicates acidic and alkaline nature of water. The monthly variation in pH ranges from 6.63 to 8.12, with an average 7.24. It was recorded higher in the month of April while lower recorded in the month of August. Increase of pH has recorded during summer months might be due to decrease in water level or either due to increased amount of carbonates and or photosynthetic activities by producers (Abubacker *et al.* 1996). The lower value during rainy season may be due to dilution of rain water. Similar trends have been noted by Latha *et al.* (2010), Shinde *et al.* (2011).

Electrical conductivity:

Electrical conductivity is major of water capability to transmit electric current and also it is tool to access the purity of water (Murugesan *et al.* 2006). The monthly variation in electrical conductivity ranges from 0.191 mhos/cm to 0.28 mhos/cm, with an average values 0.276 mhos/cm. It was recorded maximum during month of April while it was recorded minimum during month of August. Increased conductivity during summer season may be due to increased concentration of salts because of evaporation. Dilution of water during rainy season causes decrease in electrical conductance due to addition of rain water. Similar trend have been given by Krishnamurthy *et al.* (2010), Sharma *et. al.* (2011).

Free CO_2:

Carbon dioxide is one of the most important substances in the life of organisms. The carbon dioxide is necessary for the growth and development of plants and therefore for life itself, although the minimal quantities required are very small (Welch, 1952). The monthly variation in free carbon dioxide ranges from 00 mg/l to 21.26 mg/l with an average of 6.48 mg/l. It was found to be absent in the month of December to May. It was maximum in the month of August. Free CO_2 content in water sample was negligible in majority of the months, might be due to pollution and photosynthetic activity of algae (Sreenivasan, 1971). Similar trend has been given by Manjare *et al.* (2010).

Total alkalinity:

Total alkalinity is the measure of the capacity of water to neutralize of strong acid. The alkalinity in water is generally imparted by the salts of carbonates, bicarbonates, phosphates, nitrate, borates, and silicates etc. together with the hydroxyl ions in Free State.

The monthly variation in total alkalinity ranges from 112 mg/l to 153.33 mg/l, with an average values 134.93 mg/l. The alkalinity was maximum in the June while minimum in the month of August. Alkalinity was maximum in summer season due to increase in bicarbonate in water while minimum in rainy seaason due to increase in water level causing dilution. Similar results were obtained by Chinnaiah *et al.* (2011), Hulyal *et al.* (2011).

Total Hardness:

Hardness is governed by the concentration of calcium and magnesium salts largely combined with bicarbonates and carbonates giving temporary hardness while sulfate, chloride and other anions of mineral acids causing permanent hardness. The monthly variations in total hardness ranges between 88.5 mg/l to 136 mg/l, with an average values 114.31 mg/l. The maximum amount of hardness was recorded in the month February and minimum amount of total hardness recorded in the month of July. The higher value of hardness was during summer may be due to decrease in water level and evaporation of water. Similar trend was reported by Sahib (2011), Sangpal *et al.* (2011).

Kanan (1991) has classified water on the basis of hardness values as 00 mg/l to 60 mg/l is soft, 61 mg/l to 120 mg/l is moderately hard, 121 mg/l 180 mg/ l is hard and greater than 180 mg/l is very hard. According to this classification water of this reservoir falls in the category of moderately hard to hard. However, hardness of this reservoir was within the permissible limit (WHO, 1984). Hardness below 300 mg/l is considered as potable.

Calcium:

Calcium is most abundant ion in the freshwater and is an important in shell construction, bone building and plant precipitation of lime (Jhingram, 1975). The monthly variation in calcium ranges from 24.16 mg/l to 35.55 mg/l, with an average values of 29.35 mg/l. It was minimum in the month of August while maximum in the month of April. The maximum desirable limit of calcium in drinking water is 75 mg/l (WHO, 1984). Calcium content in water of this reservoir is within the desirable limit.

Magnesium:

Magnesium is absolutely essential for chlorophyll bearing plants and algae. The magnesium appears to act as a carrier of phosphorus (Welch, 1952). The monthly variations in magnesium ranges from 15.25 mg/l to 25.99 mg/l with an average of 21.09 mg/l. It was minimum in the month of July while maximum in the month of February. Similar trend has been reported by Narayana *et al.* (2005). Permissible limit of magnesium content for drinking

purpose is 50 mg/l and maximum limit is 150 mg/l. The maximum values are found to be below the desirable limit.

Chloride:

Chloride is an important parameter in accessing the water quality. It controls the salinity of water and osmotic stress on biotic communities (Banerjee, 1967). The monthly variation in chloride values ranges from 12.3 mg/l to 64.37 mg/l, with an average values 32.91 mg/l. The maximum amount of chlorides was recorded in the month of April while minimum amount of chloride was recorded during August. Higher chloride concentration during summer season due to high temperature and higher evaporation while lower concentration in rainy season due to dilution. Similar trend were reported by Khabade and Mule (2005) and Sumitra *et al.* (2007).

Total dissolved solids:

Total dissolved solids are the solids present in water in the dissolved state. The monthly variations in the total dissolved solids ranges from 98 mg/l to 172.66 mg/l, with an average 136.31 mg/l. It was recorded maximum in the month of May while it was recorded minimum in the month of August. It was recorded maximum during summer season owing to loss of water due to heat and concentration of salts present in water. It was minimum during rainy season due to dilution of water. Similar trend have been reported by Chinnaiah *et al* (2011), Ajagekar *et al.* (2011).

Nitrogen:

Nitrates enter in an aquatic body from various sources like erosion of natural body or soil, as well as artificially fertilized soil and through rain fall and sewage (Kapoor and Bamniya, 2011). The monthly variations of nitrogen ranges from 0.263 mg/l to 2.57 mg/l with an average value 0.668 mg/l. it was minimum in the month of January while maximum in the month of July. High nitrogen concentration during the rainy season might be due to influx nitrogen rich flood water. Similar values have been observed by Shinde *et al.* (2011) and Verma (2012).

Phosphorus:

Phosphorus is considered to be the most significant among the nutrients responsible for eutrophication of lakes, as it is the primary limiting factor. Atmospheric input may account for significant proportion of the influx of nutrients to the lakes (Krishna *et al.,* 2007). Monthly variation in phosphorus ranges from 00 mg/l to 0.225 mg/l with an average of 0.0262 mg/l. It was absent in the month of January, March and May while maximum in the

month of August. The high values of phosphorus in the rainy months mainly due to rain, surface water runoff, agricultural runoff etc. Similar results were obtained by Simpi *et al.* (2011).

Dissolved Oxygen:

Dissolved oxygen acts as an indicator of trophic status and magnitude of eutrophication in freshwater ecosystem. The exchange of oxygen across air water interface depends upon temperature, partial pressure of gases in atmosphere, dissolved salt concentration, wave action, relative solubility, photosynthetic activity of plants and respiration by bacteria, plants, animals in the water (Krishna *et al.* 2007). The monthly variations in dissolved oxygen range from 6.081mg/l to 12.026 mg/l, with an average values 8.627 mg/l. The maximum values were recorded during December while minimum values were recorded during May. Lower oxygen concentration was observed in summer season because dissolved oxygen decreases with increase in temperature and vice versa. Similar observations have been reported by Khuhawar *et al.* (2009) and Verma *et al.* (2012).

Biological oxygen demand:

BOD is the measure of degradation of organic matter present in water. The BOD refers the oxygen used by the micro-organisms in the aerobic oxidation of organic matter. The monthly variation in BOD ranges from 0.945 mg/l to 8.518 mg/l with an average of 3.88 mg/l. It was minimum in the month of July while maximum in the month of December. Higher values of BOD during winter season were due to input of an organic waste and enhanced bacterial activity. The present values are similar as reported by Devi *et al.* (2009) and Verma *et al.* (2012).

References

[1] Abubacker, M.V., Kannan, V., Sridharan, M., Chandramohan M. and Rajavelu, S. (1996). Physico-chemical and biological studies on Uyyakondan canal water of River Cauvery. *Pollution Research* 15 (3): 257-259.

[2] Ajagekar, V.V., K.N. Nikam and C.V. Pawar (2011). Physco-chemical limnology of Chitri reservoir, Ajara, Maharashtra. *Nat. Envi. and Poll. Tech.* 10 (1): 145-146.

[3] Banerjee S.M. (1967). Water quality and soil conditions of pond in some states of India in relation to fish production. *Indian J. Fish.* 14: 115-144.

[4] Basavaraja Simpi, S.M Hiremath, K.N.S Murthy, K.N. Chanrashekarappa, Anil N. Patil and E.T. Puttaih (2011). Analysis of water quality using physic-chemical parameters of

Hosahalli tank in Shimoga District, Karnataka, India. *Global J. of Science Frontier Research,* 11 (3): 30-34.

[5] Ch. Debala Devi and Usha Anandhi (2009). Assessment of water quality for aquaculture: A case study of Madhawala Lake in Bangalore. *Nat. Envi. and Poll. Tech.* 8 (4): 755-760.

[6] Chinaiah B. and B. Digambar Rao (2011). Physico-chemical characteristics of Pakhal Ramappa Lake, A.P. India. *Nat. Envi. and Poll. Tech.* 10 (1): 103-104.

[7] Garg R.K., D.N. Saksena and R.J. Rao (2006). Assessment of physico-chemical water quality of Harsi reservoir, District Gwalior, Madhya Pradesh. *J. Eco Physiology Occup. Hith.* 5: 53-54.

[8] Goutam Ranjan, N.P. Singh and R.B. Singh (2007). Physico-chemical characteristics of Ghariyarwa pond of Biranj, Nepal in relation to growth of phytoplankton. *Nat. Envi. and Poll. Tech.,* 6 (4): 629-632.

[9] Hulyal S.B. and Kaliwal B.B. (2011). Seasonal variations in physico-chemical characteristics of Alamatti reservoir of Bijapur district, Karnataka state. *UEP,* 1 (1): 58-67.

[10] J. Narayana, R. Purushothama, B.R. Kiran, K.P. Ravindra Kumar and E.T. Putiaiah (2005). Investigation of drinking water quality Basavanahole tank with reference to physic-chemical characteristics. *Fundamentalsof Limnolgy,* pp-201-206

[11] Jhingram V.G. (1975). Fish and fisheries f India, *Hindustan Publication Company* (India), Delhi. 954.

[12] Kannan K. (1991). Fundamentals of Environmental Pollution, S. Chand and Company Ltd. New Delhi.

[13] Kapoor, K. and Bamniya B.R. (2011). Water eutrophication and algal bloom. *Ecology and Conservation of Lakes, reservoirs and Rivers* (Ed. Kumar A.),ABD Publications, Jaipur, 42-57.

[14] Khuhawar, M.Y., Aslam Mirza, S.M. Leghari and Rafee Arain (2009). Limnological study of Baghsar Lake, Distrit Bhimber Azad, Kashmi. *Pak J. Bot.* 41 (4): 1903-1915.

[15] Krishna Ram H., M. Mohan, Ramachandra and Y. Vishulakshi (2007). Limnological studies on Koluramma lake, Kolar, Karnataka. *Envi. Ecol.,* 25:364-367.

[16] Krishnamrthy, A. and S. Selvaumar (2010). Seasonal variations in physico-chemical characteristics of water bodies in and around Cuddalore District, Tamil Nadu. *Nat. Envi. and Poll. Tech.* 9 (1): 89-92.

[17] Latha N and M. Ramachandra Mohan (2010). Water quality of the lake Kommaghatta, *Bangalore*. *Envi and Ecology,* 28 (3A): 1901-1905.

[18] Manjare, S.A., Vhanalkar, S.A. and Muley, D.V. (2010). Analysis of water quality using physico-chemical parameters, Tamdalge tank in Kolhapur District. *Int. J. Advanc. Biotech. and research.* 1 (2): 115-119.

[19] Muragesan, A., Ramu, A. and Kannan N. (2006). Water quality assessment from Uthamapalayan Muncipality in Thani District, Tamil Nadu, India. *Poll. Res.* 25 (1): 163-16.

[20] Nikam, K.N., V.V. Ajagekar and C.V. Pawar (2011). Study of physico-chemical nature of water from Jangamhatti dam, Chandgad, Dist. Kolhapur Maharashtra. *Nat.Envi. and Poll. Tech.* 10 (4): 655-656.

[21] Premalata Vikal (2009). Multivariant analysis of drinking water quality parameters of lake Pichhola in Udaypur, India. *Biological Forum,* 1 (2): 97-102.

[22] R. Usha (2012). Studies on seasonal variations in physico-chemical and zooplankton diversity of Porur Lake. *J Ecobiology,* 30 (3-4): 169-178.

[23] S. S. Sathe, S.A. Khabade and M.S. Hujare (2000). Studies on wetlands of Tasgaon Tahsil and its importance in relation to fisheries and agriculture productivity. Final Report submitted to University Grants Commission, New Delhi.

[24] Sahib S. Sunudeen (2011) Physico-chemical parameters and phytoplankton it the Parappar reservoirs of Kerala. *J. Ecobiolgy,* 28 (1 & 2): 187-190.

[25] Sangpal, R.R., V.D. Kulkurni and Y.M. Nadurkar (2011). An assessment of the physic-chemical properties to study the pollution potential of Ujjani reservoir. Solapur district, India. *J. o Agricultural and Biological Science,* 6 (3): 34-38.

[26] Sharma Riddhi, Sharma Vipul, Shama Madhu Sudhan, Verma Bhoopendra Kumar, Modi Rachana and Gaur Kuldeep Singh (2011). Studies on limnological charecaristics, planktonic diversity and Fishes (species) in Pichhola Lake, Udaipur, Rajasthan, India. *Universal J. of Environmental Research and Technology,* 1 (3): 274-285.

[27] Shinde, S.E., T.S. Pathan, K.S. Raut and D.L. Sonawane (2011). Studies on the physico-chemical parameters and correlation coefficient of Harsoot Savanari dam, District Aurangabad, India. *Middle East Journal of Scientific Research,* 8 (3): 544-554.

[28] Sreenivasan A. (1971). Recent trends in limnological investigation in Indian reservoirs. All India Co-ordinate research project in ecology and freshwater reservoir, CIFRI, Barrackpore, India. pp 30-31.

[29] Sumitra, M., Sharma R., Sharma V., and Sharma, M.S. (2007). Trophic status of lake Pichhola in relation to physico-chemical characteristics of its water. *National Symposium of Limnology,* 244-248 pp.

[30] Varma Pradeep, Chadawat Deepika, Gupta Urvi and Solanki Hitesh (2012). Water quality analysis of an organically polluted lake by investigating different physical and chemical parameters. *International J of Research in Chemistry and Environment,* 2 (1):105-111.

[31] Verma S.R., Tyagi A.K. and Delela R.C. (1978). Physico-chemical and biological characteristics of Kadrabed in U.P. *Indian J. of Environmental Hith,* 20: 1-3.

[32] Welch, P.S. (1952). Limnology, 2nd edition, *McGraw Hill Book Co.* New York.

[33] WHO (1984). Guideline for drinking water quality. World health organization, Geneva.

Table I: Physico-chemical parameters of Mahagaon reservoir

Parameters	**Minimum values**	**Maximum values**	**Average values**	**Standard Deviation**
Air Temp	24.03333	39.03333	29.11806	4.278015
Water Temp	22.01667	30.03333	25.09306	2.448417
Turbidity	32.5	62	45.06944	9.969272
Trans	3.566667	42.11667	12.11523	11.65878
pH	6.638333	8.126667	7.241019	0.393495
EC	0.1915	0.2765	0.252611	0.024443
CO2	0	21.26667	6.487963	7.73073
Alkalinity	112	153.3333	134.9306	11.61685
Total Hard	88.5	136	114.3194	16.47873
Calcium	24.16	35.555	29.3587	3.194237
Magnesium	15.25667	25.995	21.09588	3.216142
Chloride	12.30667	64.37333	32.91565	14.35679
TDS	98	172.6667	136.3102	17.26781
Nitrogen	0.263333	2.57	0.66287	0.598215
Phosphorus	0	0.191333	0.023412	0.05131
DO	6.081667	12.02667	8.627083	1.782745
BOD	0.945	8.518333	3.880417	2.107207