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Studies on physico-chemical parameters of Pagara Reservoir, Jaura, district Morena (M.P.)

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Abstract

Physico-chemical parameters of the water of Pagara reservoir, Jaura district Morena, Madhya Pradesh, were determined during June 2016 to May 2017. The analysis of water temperature (20.42 to 34.72°C), transparency (132 to 181.5 cm), pH (6.71 to 8.09), alkalinity (55 to 135 mg/l), dissolved oxygen (5.85 to 8.47mg/l), chloride (22.15 to 34.89 mg/l) and free carbon dioxide (3.42 to 8.98 mg/lit) indicated that the water of the reservoir is quite suitable for drinking purpose and fish culture. Stress should be given on the proper management of reservoir and to develop it into a tourist place.

Keywords: Pagara reservoir, physico-chemical and water analysis

1. Introduction

Water is the first requirement for the existence of life. The unbridled exploitation of water for irrigation, drinking and industrial purpose has caused a drastic decline of the important water resources. Physico-chemical analysis of an aquatic system indicates the water quality of that aquatic ecosystem. A number of workers from India and different parts of the world have made great contribution in the field of limnology for a long time. Adebisi carried out the limnological investigations of tropical river upper river, Nigeria ^[1]. Shukla *et al.*, studied physico-chemical and biological characteristics of domestic sewage on river Ganga ^[2]. Mani and Gaikwad made physico-chemical analysis of lake Pokhran ^[3]. Peyami studied seasonal variation from Phadke Pada pond at diva, Thane ^[4]. In Madhya Pradesh, there are many freshwater bodies in the form of rivers, lake and man-made reservoirs. Gwalior and Chambal divisions is rich in water resources and reservoirs. A number of workers have made physico-chemical analysis of various water bodies of Madhya Pradesh ^[5-10]. Pagara reservoir is located in Jaura, district Morena of Madhya Pradesh. The water of Pagara reservoir is used for irrigation, drinking, fish culture and other domestic purposes. The present study was carried out to study the physico-chemical analysis of the reservoir for the period June 2016 to May 2017.

2. Materials and Methods

2.1 Collection of samples

The water samples were collected from the four sites of Pagara reservoir i.e. A, B, C and D. The water samples were collected during the morning hours between 8 to 10 AM, each month for the study period from June 2016 to May 2017. The water samples were stored in dried plastic cans of 2 lit. capacity. During the study period physico-chemical parameters like water temperature and transparency were determined on the sampling spot. Water temperature were determined with the help of Thermometer (0-50°C) and water Transparency measured by Secchi disc. Rest of the parameters were determined in the laboratory.

2.2 Study area

Pagara dam is situated on Asan river at about 13 Km from Jaura town of Morena District of Madhya Pradesh (Fig.1). The dam was constructed for irrigation of the nearby villages. It is a masonry dam which was constructed in 1931. The dam is located at latitude 26°09'27.9"N and longitude 77°48'22.3"E. The FTL (Full tank Level) of the dam is 199.34m. The dam was constructed mainly for irrigation purpose. The water is used for irrigation of 870 acre land of the nearby villages. Pagara is the nearest village, after the name of which the dam is known as

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Pagara dam. Besides irrigation, the water is also used for drinking purpose, and also for fish culture by local fishermen.



Fig 1: Satellite view of Pagara Reservoir (<https://www.google.com/maps/place/Pagara>)

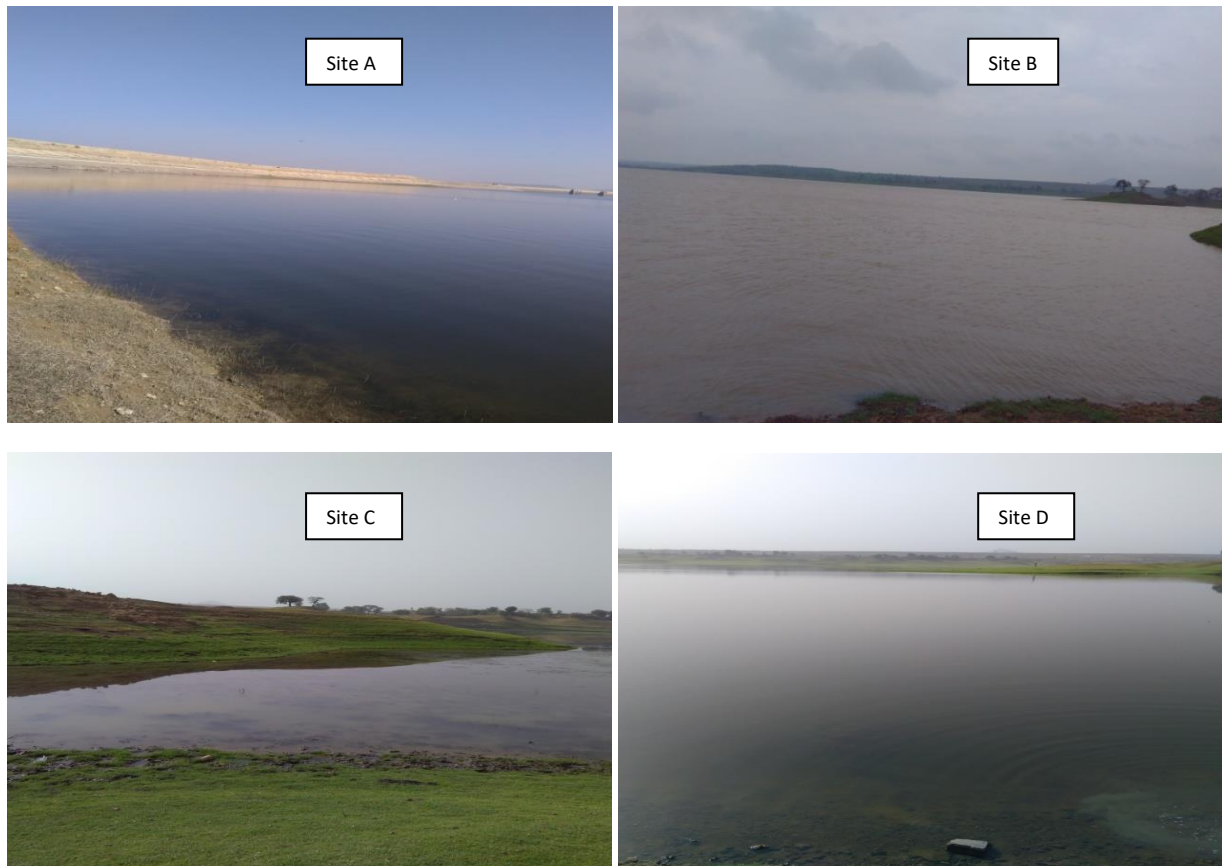


Fig 2: Different sampling stations A, B, C and D at Pagara reservoir.

Table 1: Physico-chemical parameters studied at Pagara reservoir from June 2016 - May 2017(All values are the average values of the four sampling stations A, B, C and D)

Parameters	June-16	July-16	Aug.-16	Sept.-16	Oct.-16	Nov.-16	Dec.-16	Jan.-17	Feb.-17	Mar.-17	Apr.-17	May -17
Temperature (°c)	34.72	28.55	32.6	29.35	27.5	24.4	22.4	21.42	21.1	25.57	28.55	32.6
Transparency (cm)	155	142.5	135.5	132	139.4	164	171	181.5	173.5	157	138.5	159.5
pH	8.09	7.91	6.73	6.95	6.71	6.96	7.04	6.88	7.25	7.18	7.64	8.6
D.O (mg/l)	5.85	6.65	7.5	8.05	8.47	8.42	8.45	8	8.1	7.25	7.58	6.65
Alkalinity (mg/l)	135	127.5	120	97.5	78.75	58.75	62.5	55	71.25	82.5	103.75	131.25
Chloride (mg/l)	34.89	31.41	28.37	24.44	24.96	24.4	22.3	22.15	24.44	27.37	30.94	33.98
Free CO ₂ (mg/l)	8.98	7.96	6.28	5.37	3.78	4.4	3.42	3.65	4.04	5.33	6.59	8.52

3. Result and Discussion

The results of physico-chemical parameters of Pagara reservoir water are summarized in table 1 and shown in figures from 3 to 16.

Water temperature is one of the most valuable physical factors which regulates the natural process of the environment. Temperature plays an important role in aquatic ecosystem. The temperature of drinking water has an influence on its taste. In Pagara reservoir water temperature ranged from 20.42°C to 34.72°C during the study period. During the study period maximum water temperature was recorded in summer season and minimum in winter season. Increase in water temperature, during summer was due to decrease in water level and exposure of the water to maximum solar radiation. Peyami reported water temperature being highest during summer and lowest during winter in Phadke Pada pond at Diva, Thane [4]. In Ramganga river, Bareilly, Singh and Gaur observed water temperature to be in the range of 28.5°C to 30°C [11]. Recently, Pentewar recorded maximum temperature during summer (35.8°C) in the months of May, June and July and minimum during winter (16.4°C) in the months of December and January [12].

Transparency is related to the depth to which light penetrates water. The transparency indicates the productive nature of the water. Transparency is dependent on turbidity which is directly proportional to the amount of suspended matter. Transparency of Pagara reservoir varied from 124.5 cm to 180 cm. Maximum transparency was recorded in winter season, in the month of December and minimum in monsoon season in the month of July. By Balkhi, Khanna and Sharma also reported similar results in their observations [13, 14, 6, 7]. Low transparency during summer may be attributed to the growth of phytoplanktons. In Wan reservoir, the highest transparency was reported in summer, in the month of May and lowest in winter in the month of December observed by [15]. Thirupathaiah *et al.* found transparency in the range of 18.58 to 32.62 cm in Manair reservoir, district Karimnagar Andhra Pradesh [16]. Peyami found highest transparency in winter season and lowest in rainy season in Phadke Pada pond, Thane [4]. In Mohabala lake, near Bhadrawati, Mahajan and Pokale observed transparency in the range of 11.00 cm to 72.33 cm [17]. Recently, Mitter, recorded water transparency varied between 73 to 95 cm in Powai lake, Mumbai [18].

pH is a measure of hydrogen ion concentration and indicates how much acidic or basic the water is. pH is one of the most important parameters in the chemistry of water. If the pH value is high it indicates that water is more corrosive in nature. There are various factors which bring about change in the pH of water. In Pagara reservoir average value of pH varied between 6.69 to 8.32 throughout the study period. During the study period, maximum value of pH was observed during June 2017 at station D, and minimum value was recorded during December 2016 at station A. Ganapati and Verma have observed the value of pH range from 8.0 to 9.0 in Indian water [19, 8]. Mahajan and Pokale reported pH between 6.80 to 3.30 in Mahabala lake near Bhadrawati [17]. Pentewar also recorded pH in the range of 7.3 to 8.6 in Godavari river in Maharashtra. He found the water of Godavari river was slightly alkaline [12].

Dissolved oxygen is one of the most important factors in any aquatic ecosystem. Dissolved oxygen acts as an indicator of physical and biological activity of water resources. Dissolved oxygen, in aquatic ecosystem, brings out various biochemical changes. In the Pagara reservoir average dissolved oxygen

ranged from 5.85 to 8.47 mg/lit. The maximum value was recorded during winter and minimum during summer season. Seasonally, high values of dissolved oxygen were noticed during winter season at all stations A, B, C and D. Minimum values of dissolved oxygen were recorded during summer season. Adebisi, Sakhare and Joshi, Pawar and Pulle, Kadam *et al.*, Srinivasarao *et al.*, Kamble and Mulle, Ayoade and Lokhande *et al.* also observed similar pattern [1, 20-26]. The high value of dissolved oxygen reported in Pagara reservoir during winter might be due to increase in photosynthetic activity which liberates a considerable amount of oxygen in water. At low temperature the solubility is high and there is less degradation of organic substance during winter. Recently, Pentewar, found dissolved oxygen in the range of 1.9 to 9.8 mg/lit maximum in winter and minimum during summer season [12].

Alkalinity measures the ability of the water to absorb H⁺ without significant changes in pH. In natural water, most of the alkalinity is caused due to CO₂. The CO₂ dissolves in water to form carbonic acid in large quantities. Alkalinity, pH and hardness affect the toxicity of many substances, in the water. Alkalinity imparts bitter taste to the water. The average alkalinity ranged between 55 to 135 mg/l in Pagara reservoir. In Pagara reservoir maximum total alkalinity was recorded during summer and minimum during rainy season. Seasonally maximum value of alkalinity was found during summer and minimum during monsoon season. According to Jhingran, low alkalinity is not conducive for good productivity and highly productive waters have alkalinity more than 100 mg/lit [27]. Since the total alkalinity of Pagara reservoir was found between 55 to 135 mg/lit., this indicates that the water of Pagara reservoir has good productive. Mahajan and Pokale also recorded alkalinity in the range of 22 to 115 mg/lit. In their investigation in Mahabala lake near Bhadrawati [17].

Chloride is one of the important indicators of pollution. Chloride is present in sewage and effluents. Chloride is usually present in low concentration in natural water and plays metabolically active role in photolysis of water and photophosphorylation. In the Pagara reservoir, the chloride contents ranged between 22.15 to 34.89 mg/lit. High concentration of chloride in this reservoir was observed during summer and low during winter season. Joshi reported maximum chloride content (49.2 mg/lit) in April and minimum (19.3 mg/lit) in August [28]. Similar observation were made by Mukherji and Nandi, Sakhare, Jagtap *et al.*, Khaire *et al.* and Bade *et al.* recorded highest value of chloride during summer (40.21 mg/lit), and lowest during winter (35.14 mg/lit) of Sai reservoir District Latur, Maharashtra [29-33]. Sharma recorded chloride value in the range of 11.3 and 40.7 mg/lit in Tighra reservoir [5]. He found high concentration of chloride during summer and low during winter. Recently, Lingampally *et al.* observed chloride content between 141.82 to 198.55 mg/lit in Chakki talab, Bodhan, Telangana [34].

The respiratory activities of aquatic plants, animals and decay of organic matter produce carbon dioxide, which is highly soluble in natural waters. It is an essential raw material for the photosynthesis of green plants. It is also evident that carbon dioxide acts as a limiting factor in the process of photosynthesis when the density of phytoplankton is high. The free carbon dioxide values of Pagara reservoir varied from 3.42 to 8.98 mg/lit. The maximum values were recorded during summer and minimum during winter, followed by monsoon. Garg *et al.* recorded high values of free CO₂ (6.32

mg/lit) in Ramsagar reservoir [10]. In Mohabala lake near Bhadrawati, Mahajan and Pokale was recorded Free CO₂ between 1.3 to 9.3 mg/lit by [17].

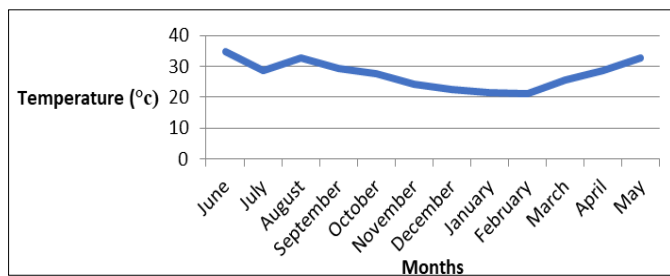


Fig 3: Monthly variations in Temperature (°C) water of Pagara reservoir, from June 2016-May 2017

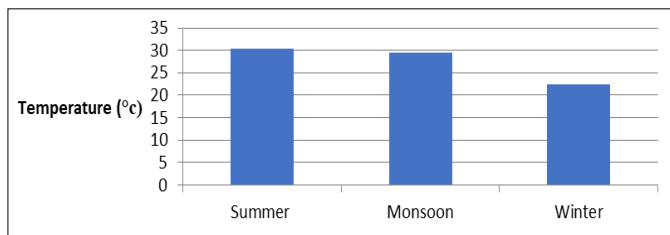


Fig 4: Seasonal variations in Temperature (°C) at Pagara reservoir, from June 2016-May 2017

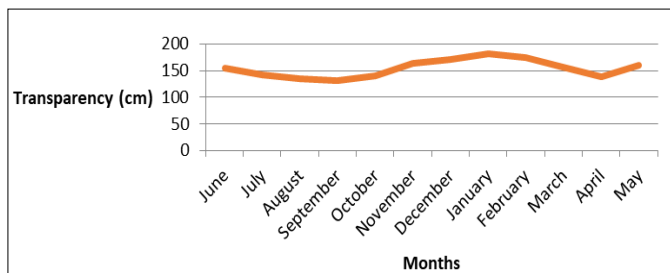


Fig 5: Monthly variations in Transparency (cm) water of Pagara reservoir, from June 2016-May 2017

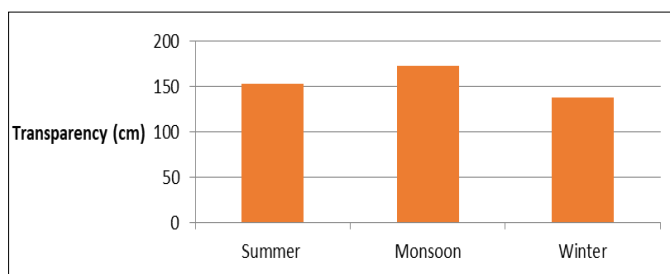


Fig 6: Seasonal variations in Transparency (cm) at Pagara reservoir, from June 2016-May 2017

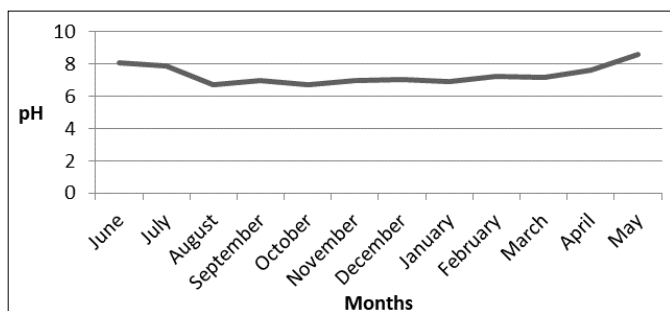


Fig 7: Monthly variations in pH water of Pagara reservoir, From June 2016- May 2017

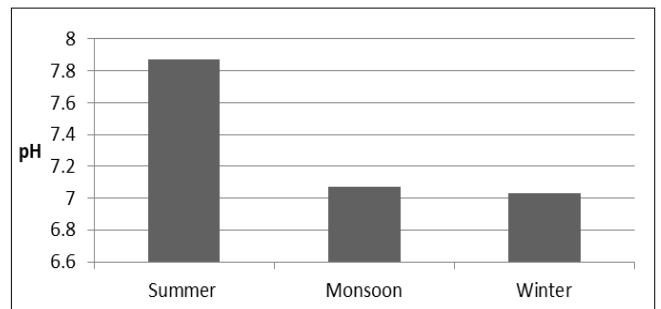


Fig 8: Seasonal variations in pH at Pagara reservoir, From June 2016-May 2017

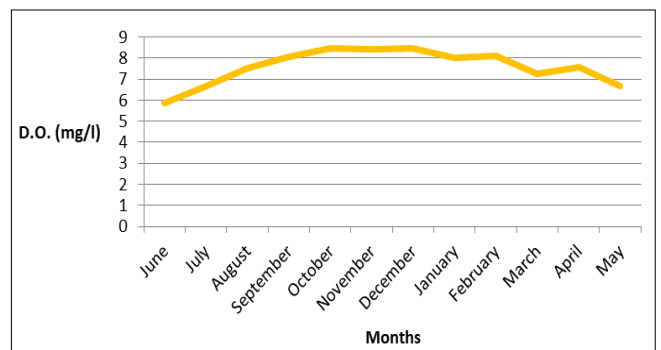


Fig 9: Monthly variations in Dissolved (mg/l) oxygen water of Pagara reservoir, from June 2016-May 2017

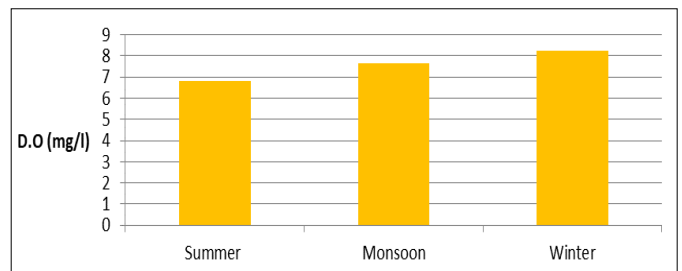


Fig 10: Seasonal variations in Dissolved (mg/l) oxygen at Pagara reservoir, from June 2016-May 2017

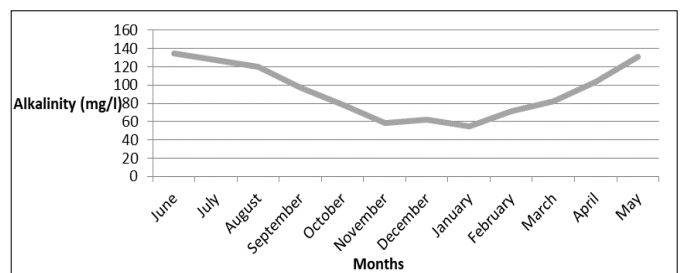


Fig 11: Monthly variations in Alkalinity (mg/l) water of Pagara reservoir, from June 2016-May 2017

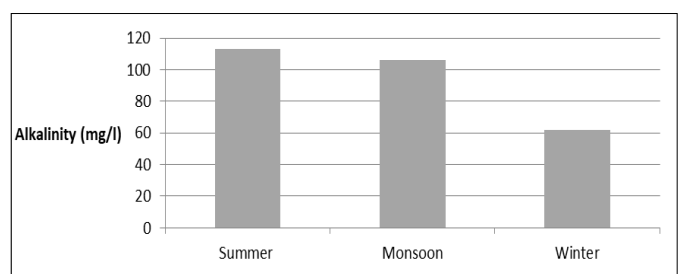


Fig 12: Seasonal variations in Alkalinity (mg/l) at Pagara reservoir, from June 2016-May 2017

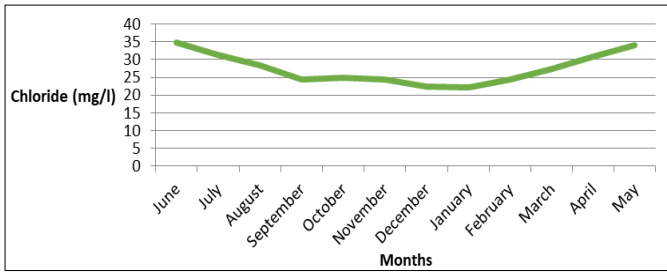


Fig 13: Monthly variation in Chloride (mg/l) water of Pagara reservoir, from June 2016-May 2017

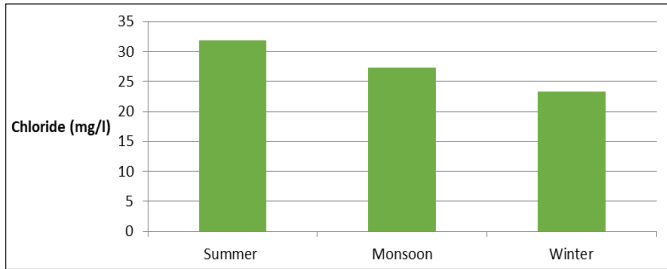


Fig 14: Seasonal variations in Chloride (mg/l) at Pagara reservoir, from June 2016-May 2017

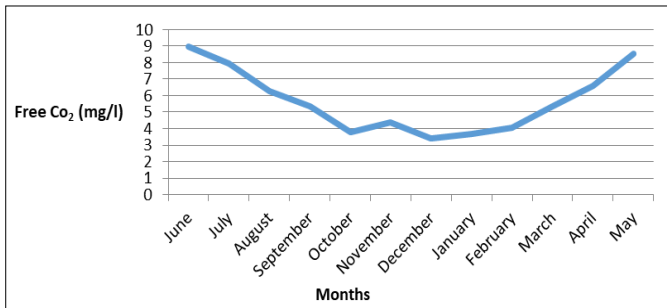


Fig 15: Monthly variations in Free carbon di oxide (mg/l) water of Pagara reservoir, from June 2016-May 2017

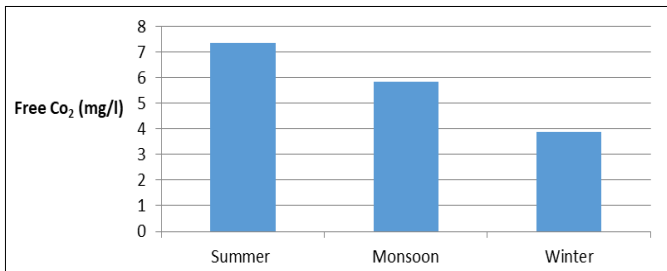


Fig 16: Seasonal variations in Free carbon di oxide (mg/l) at Pagara reservoir, from June 2016-May 2017

4. Conclusion

In the present study all physico-chemical parameters ranged in permissible limit of drinking water. The study indicates that the water of Pagara reservoir is suitable for drinking purpose. Different parameters indicate that the water is also suitable for fish culture and agriculture.

5. Acknowledgement

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6. References

1. Adebisi BA. The physico-chemical hydrobiology of tropical river upper urgan river, Nigeria. *Hydrobio.* 1981; 79(2):757-765.

2. Shukla SC, Tripathi BD, Rajanikant V Deepakumari, Pandey VS. Physico-chemical and biological characteristics of river Ganga from Mirzapur to Ballia. *Indian J. Environ. Hlth.* 1989; 31(3):218-227.

3. Mani Bharat, Gaikwad SA. Physico-chemical characteristics of the Lake Pokhran. *Indian J. Environ. And Taxicol.* 1998; 8(2):56-58.

4. Peyami FY. Studies on seasonal variations in physico-chemical parameters of Phadke Pada pond at Diva, Thane, India. *Int. J. Life. Sci.* 2016; 2(4):281-284.

5. Sharma DK. Limnological study of Tighra reservoir, Gwalior, (M.P.). *Astral. Int. Pvt. Ltd. New Delhi*, 2017.

6. Sharma DK. Seasonal variations in certain physico-chemical characteristics in Makroda reservoir of Guna district. *Ecol. Environ. Cons.* 2006; 7(2):201-204.

7. Sharma DK. Studies on the Ecology and Fish fauna of Makroda reservoir of Guna district, (Madhya Pradesh). In: *Advances in Aquatic Ecology Vol.I Ed. V.B. Sakhare, Daya Publishing House, New Delhi.* 2007; pp.31-34.

8. Verma MN. Hydrobiological studies of a tropical impoundment Tekanpur reservoir Gwalior, India. With special reference to breeding of Indian carp. *Hydrobiologia.* 1969; 34:358-368.

9. Prajapati R, Rokde R. Study of correlation of drinking water in Indore city (M.P.). *Int. J. Sci. Res.* 2018; 1(7):2020-2022.

10. Garg RK, Rao RJ, Uchchariya D, Shukla G, Saksena DN. Seasonal variation in water quality and major threats to Ramsagar reservoir, India. *African. J. Envntal. Sci. Tech.* 2010; 2(4):061-076.

11. Singh P, Gaur A. Physico-chemical and biological characteristics of river Ramganga at Bareilly. *Int. J. Curr. Res.* 2017; 12(9):62249-62252.

12. Pentewar MS. Physico-chemical aspects of Godavari river at Nanded district (M.S.), India. *Int. J Life. Sci.* 2018; Special Issue A10:174-176.

13. Balkhi MH. Hydrobiology of Anchor lake, Kashmir. *Physiol. Eco.* 1987; 12(3):131-139.

14. Khanna DR. Ecology and Pollution of Ganga river, Ashish Publishing House, New Delhi, 1993.

15. Bukhtar PP, Sakhare. Studies on physico-chemical parameters of Wan reservoir on Beed District, Maharashtra. *Limnology Current Perspective (Ed. V.B. Sakhare).* Daya Publishing House, Delhi, 2011; pp.18-22.

16. Thirupathaiah M, Samatha C, Sammaiah C. Analysis of water quality using physico-chemical parameters in lower Manair reservoir of Karimnagar district, Andhra Pradesh. *Int. J. Envnt. Sci.* 2012; 1(3):172-180.

17. Mahajan VS, Pokale SS. Studies on physico-chemical analysis of Mohabala lake near Bhadrawati, district Chandrapur (M.S.), India. *Int. J Life. Sci.* 2017; 3(5):438-446.

18. Mitter C. Status of water quality of Powai lake, Maharashtra, India. *Int. J Sci. Res.* 2018; 1(7):1623-1625.

19. Ganapati SV. The ecology of tropical waters. *Proc. Symposium on Algology (1959) (ICAR 1960).* 1960; pp.204-218.

20. Sakhare VB, Joshi PK. Physico-chemical limnology of Papnas- a minor Wetland in Tuljapur town, Maharashtra. *J. Aqua. Bio.* 2003; 18(2):93-95.

21. Pawar SK, Pulle JS. Study on physico-chemical parameters in Pethwadaj dam, Nanded district of Maharashtra, India. *J. Aqua. Bio.* 2005; 20(2):123-128.

22. Kadam MS, Pampatwar DV, Mali RP. Seasonal

- variations in different physico-chemical characteristics in Masoli reservoir of Parbhani district (M.S.). *J Aqua. Biol.* 2007; 22(1):110-112.
23. Srinivasaro S, Khan AM, Rami YVSSL, Raghuram MV. Variation of physico-chemical characteristics of Godavari river water at Nanded (Maharashtra). And Rajahumunotry (A.P.). *J. Aqua. Bio.* 2007; 22(2):91-95.
 24. Kamble SP, Mulle CV. Study on some physico-chemical parameters of Kalbadevi estuary in Ratnagiri District of Maharashtra. *J. Aqua. Biol.* 2008; 23(2):61-66.
 25. Ayoade AA, Agarwal NK, Solanki AC. Changes in physico-chemical features and plankton of two regulated high altitude rivers Garwal, Himalaya, India. *Euro. J. Sci. Res.* 2009; 27(1):77-92.
 26. Lokhande MV, Rathod DS, Shembekar VS, Dande KG. Studies on oxygen levels and temperature fluctuations in Dhanegaon reservoir in Osmanabad. *Advances on Aquatic Ecology Vol.3* (Ed. V.B. Sakhare), Daya Publishing House, New Delhi. 2010; pp.152-157.
 27. Jhingran AG. Limnology and production biology of two man-made lakes on Rajasthan (India), with management strategies for their fish yield optimization. Final report IDA Fisheries management in Rajasthan. Central Inland Fisheries Institute, Barrackpore, India. 1989; pp.1-63.
 28. Joshi PK. Physico-chemical analysis of water from Ekrak Reservoir, Maharashtra for Potability. In: *Ecology of lakes and Reservoirs*, Ed. V.B. Sakhare, Daya publishing House, Delhi. 2006; pp.132-137.
 29. Mukherji M, Nandi NC. Ecology biodiversity and management of Rabindar Sarovar in Kolkata, West Bengal. In: *Ecology of lakes and reservoirs*. Ed. V.B. Sakhare, Daya Publishing House, New Delhi. 2006; pp.36-53.
 30. Sakhare. Studies on physico-chemical parameters of Wan reservoir on Beed District, Maharashtra. *Limnology Current Perspective* (Ed. V.B. Sakhare). Daya Publishing House, Delhi. 2011; pp.18-22.
 31. Jagtap VP, Bhagwan HK, Kamble SM. Studies on seasonal variation on Physico-chemical characteristics of Sina-Kolegaon Reservoir in Osmanabad District, Maharashtra. *Limnology current perspective* (Ed. V.B. Sakhare) Daya Publishing House, Delhi. 2011; pp.23-31.
 32. Khaire BS, Mohekar AD, Chavan RJ. Assessment of physico-chemical parameters and fish diversity of Mehakari reservoir in Beed district, Maharashtra. *Limnology Current Perspective* Ed. V.B. Sakhare, Daya Publishing House, New Delhi. 2011; pp.201-206.
 33. Bade BB, Kulkarni DA, Kumbhar AC. Studies on Physico-chemical parameters in Sai reservoir, Latur district, Maharashtra. *Int. Res. Jour.* 2009; 7(II):31-34.
 34. Lingampally V, Solanki VR, Jayaram V, Sabita RS. Study of some physico- chemical water quality parameters of Chakki talab, Bodhan, telangana. *Int. J Life. Sci.* 2018; 1(6):276-278.
 35. APHA. Standard methods for the examination of water and waste water 17th edition. American Public Health Association, Washington D.C, 1989.
 36. WHO. International standards for drinking water. World Health Organization Technical Report, 1984.