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Physico chemical properties of water of Sakalda Pond at Madhya Pradesh, India

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Abstract
Sakalda pond is located in the Tehsil Manwar, district Dhar. This water body was basically constructed for drinking water for tribal people. But nowadays water is mainly utilized for irrigation and fish culture. The main source of water in this pond is rainy water. Limnological study was carried out for the period one year from October 2019 to September 2020 to enumerate the various physico-chemical parameters of Sakalda pond. Water samples were collected from sampling stations every month and were analysed as per standard methods. Minimum value of Total solids, DO and Chloride was recorded in January month and maximum value in June-July months. The results of present study indicate that physico- chemical parameters of Sakalda pond are within WHO limits.

Keywords: water, DO, chloride, limnological study and physico chemical

Introduction
India is a unique country with great cultural diversity associated with all kinds of climates, rich flora and fauna. In spite of enormous volume of hydrosphere only a small portion of it is actually available as resource. More than 97% occurs in the form of sea, whose salinity makes it useless, while fresh water makes up only 2.6%.
Water is a basic need of life and is the foundation for human survival and development. Water is the most common substance on earth, covering seven tenths of the world's surface, and that is why earth is also called the blue planet. Life first started in water and 96% of the composition of all living cells is water. Water is one of the prime needs of life. We can hardly live for few days without water. Since time immemorial freshwater has always been of vital importance to man as his early habituations were within easy reach of rivers, tanks, dams, ponds and lakes. The importance of freshwater resources, their conservation and utilization has attained almost utmost importance during the present time.
Sakalda pond is located in the Tehsil Manwar, district Dhar. This water body was basically constructed for drinking water for tribal people. But nowadays water is mainly utilized for irrigation and fish culture. The main source of water in this pond is rainy water. There are many villages are situated around this pond. Distance of Sakalda pond is 104 km from Indore.
Water pollution, including siltation, is endemic to almost all inhabited parts of the world and is consistently ranked as one of the major threats to freshwater ecosystems (Richter *et al.*, 1997) [8]. Habitat loss and habitat degradation are also major reasons for worldwide biodiversity loss in aquatic ecosystems, and are caused by a multitude of anthropogenic disturbances (Allan and Flecker, 1993; Richter 1997) [1, 8]. The threat of global climate change is pervasive across all of the Earth's ecosystems, and is also often cited as a major threat to freshwater biodiversity (Sala *et al.*, 2000; Strayer and Dudgeon, 2010) [9, 14]. The objectives of the present study are to study the various parameters of the Sakalda pond and to suggest measure to minimize the pollution, which is increasing due to anthropogenic activities.

Material and Methods
Description of Study Area
The water samples were collected from the selected sampling stations in the Sakalda Pond which are as under.

Sampling stations
Panjariya village S-I
Bhilat Dev temple S-II
Hanuman temple S-III
Outlet channel S-IV

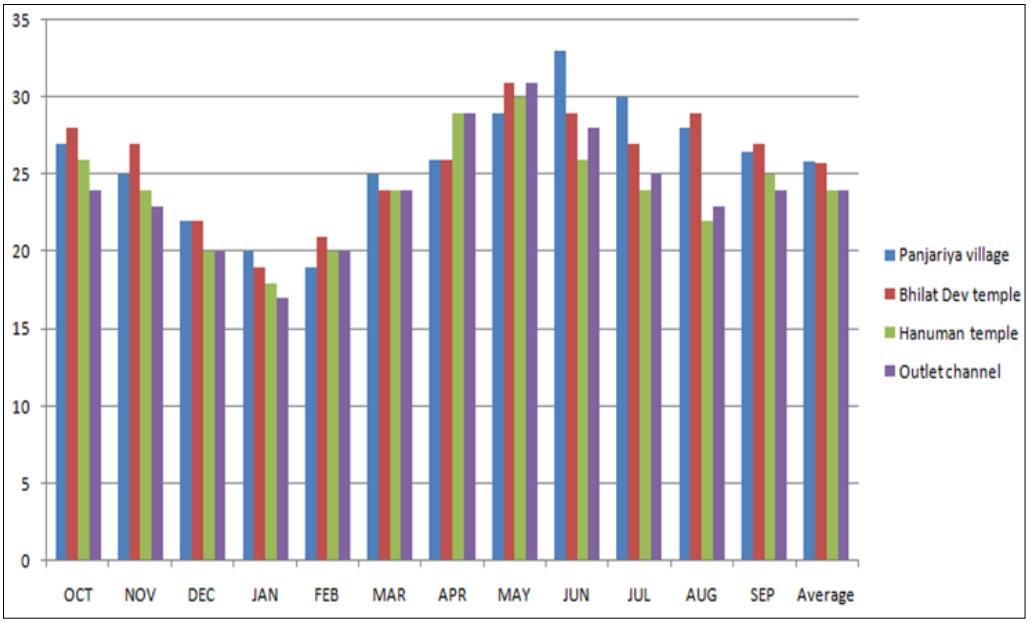
Physico chemical analysis of water
The water samples were collected from the sampling stations *viz*, Panjariya village, Bhilat Dev temple, Hanuman temple and Hanuman temple for the period of 12 months from October 2019 to September 2020. In the analysis of the Physico-chemical properties of water, standard methods prescribed in limnological literature were used.

Parameters like Temperature, pH and Turbidity were determined at the site, while other parameters like Dissolved Oxygen, Chloride, Alkalinity, total Solids were determined in the laboratory. The Physico- Chemical parameters of water were determined as per standard methods of APHA (2002) [2], Welch (1998) [16], Golterman (1991).

Results and Discussion

Water Temperature

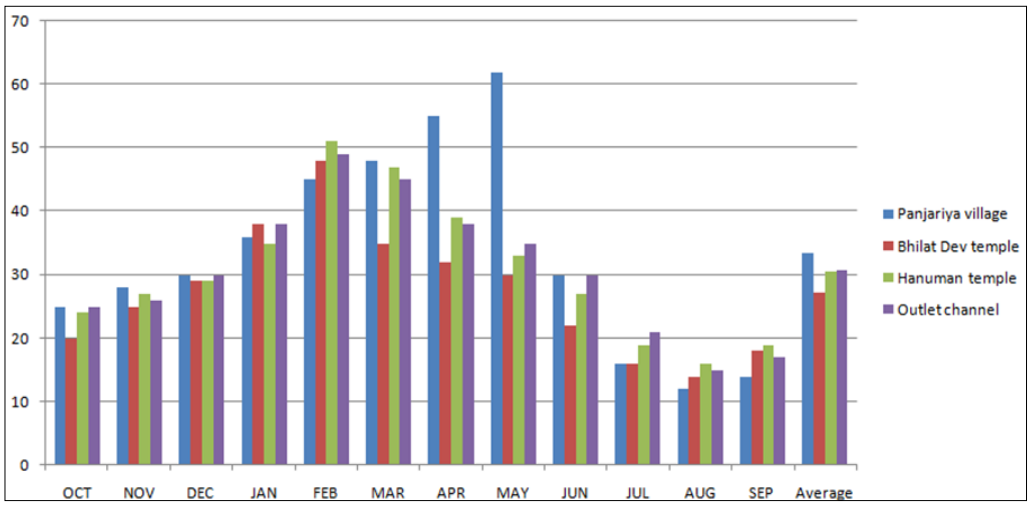
The oxidation of organic matter is highly influenced by the temperature of water. Temperature of river water depends upon the season, climatic zone, where river is flowing, time of sampling and also upon the temperature of the effluents, which are being added in the river. During October 2019 to September 2020 water temperature was recorded from 18° C to 33° C. The minimum temperature of 18° C was recorded at Station-I in January 2020 and maximum temperature 35 ° C was recorded in station-II in May 2020 and in Station-I & Station –III in May 2020 (Graph 1). The same observations were also reported by Sharma *et al.* (2011) [11] and Shraddha *et al.* (2008) [12] in Sakalda pond. Shraddha *et al.* (2008) [12] while studying the hydrological parameters of Sakalda pond at Hoshangabad recorded water temperature between 27.6°C to 38.4°C.



Graph 1: Showing Monthly Flunctuation in temperature (°C) in Sakalda Pond

Turbidity

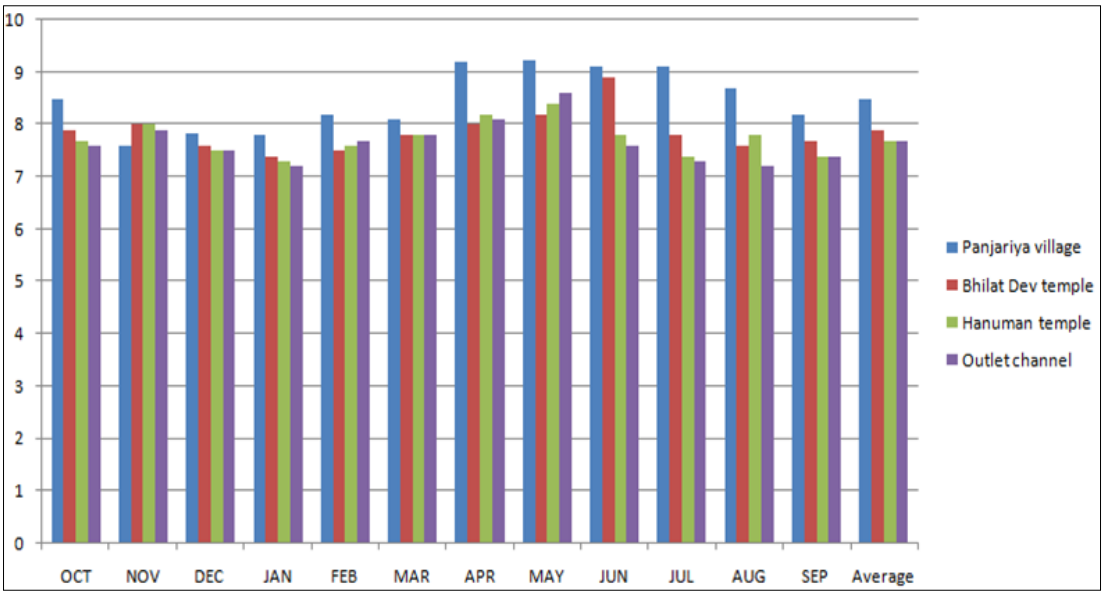
Turbidity has been long known to hinder disinfection by shielding microbes, some of them perhaps pathogens. This is most important significance of turbidity monitoring and therefore it has been an indication of effectiveness of filtration of water supplies (Hauser 2001) [3]. During October 2019 to September 2020 turbidity fluctuated from 12 NTU to 62 NTU. The minimum turbidity of 3.1 NTU was recorded at station-I in August 2020 and maximum of 62 NTU at Station-I in May 2020 (Graph 2). These observations were also supported by Prasanna and Panda (2010) [7], Shraddha *et al.* (2008) [12] and Trivedi *et al.* (2009) [15].



Graph 2: Showing monthly flunctuation turbidity (NTU) in Sakalda Pond

pH

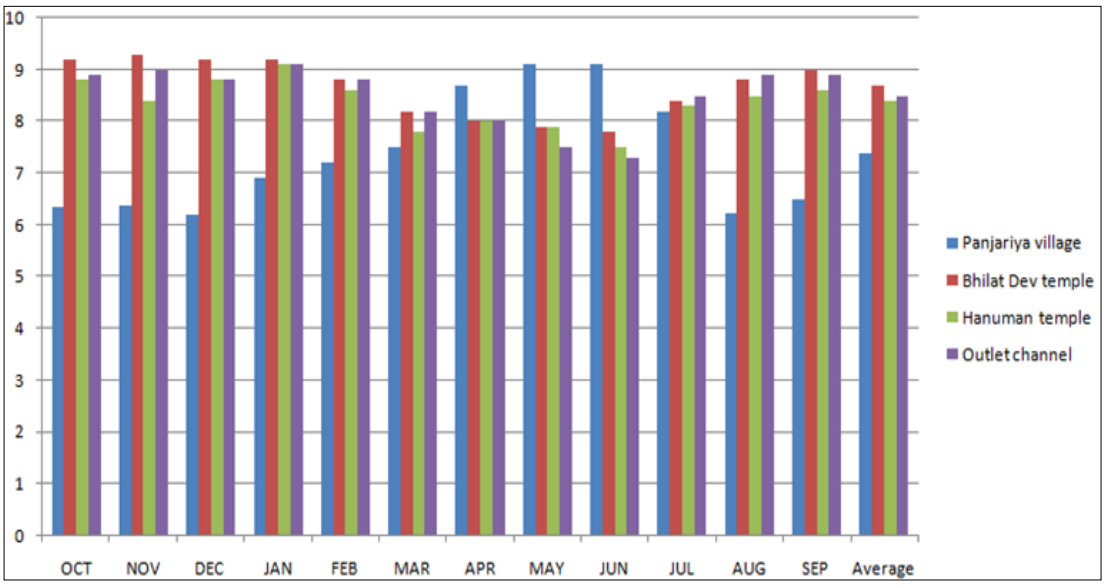
pH is an important parameter which is important in evaluation the acid base balance of water. Natural waters generally have been found to range from 5.5 to 8.6 because of the presence of bicarbonates and carbonates of alkaline earth metals. Drinking water with a pH range from 6.5 to 8.3 has been necessary. During October 2019 to September 2020 pH showed variation between 7.2 to 9.3. The minimum pH of 7.3 was recorded at station-IV January 2020 and maximum of 9.3 at station-I May 2020 (Graph 3). Sharma *et al* (2011) [11] observed pH fluctuation between 7.6 to 9.9 in Hoshangabad area of Sakalda pond. Prasanna and Ranjan (2010) [7] observed pH value between 7.5 to 8.5 in Dharma estuary.



Graph 3: Showing monthly flunctuation Ph In Sakalda Pond

Dissolved Oxygen

Dissolved oxygen is paramount importance to all living organisms and is considered to be the lone factor, which to a greater extent can revealed the nature of whole aquatic system. During the present study the dissolved oxygen showed variation from 6.2 mg/l to 9 mg/l. The minimum dissolved oxygen of 6.2 mg/l was recorded at station-I in December 2019 and maximum of 9 mg/l at station-I & station-IV in June 2020 respectively (Graph 4). Same observations were also recorded by Nnaji *et al.* (2010) [6] and Mary *et al.* (2008).

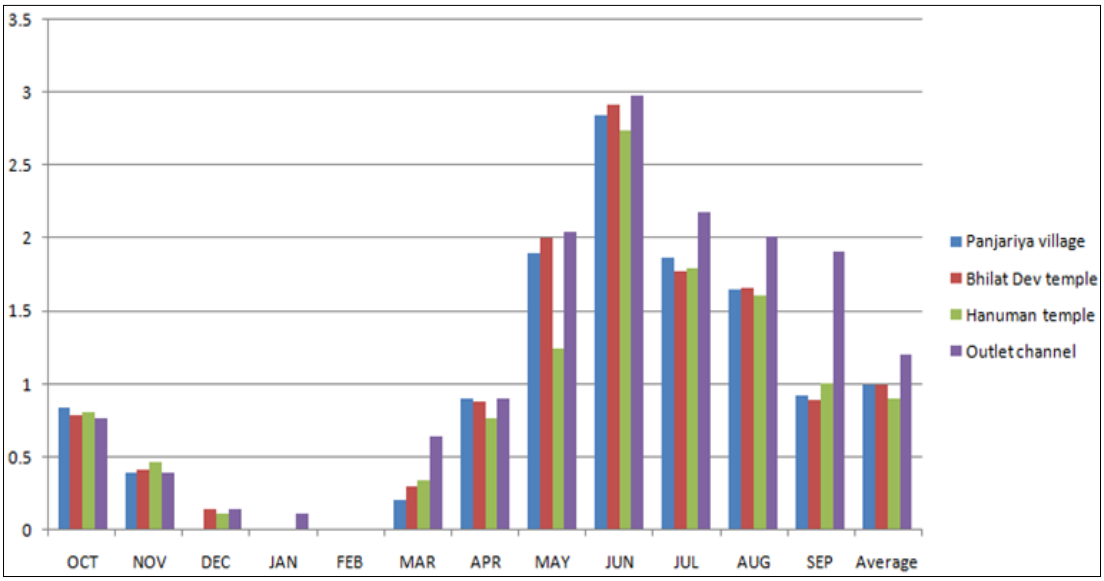


Graph 4: Showing monthly flunctuation in dissolved oxygen in Sakalda Pond

Free CO_2

Free Carbon Dioxide is the source of carbon that can be assimilated and incorporated into the living matter of all the aquatic autographs. Free CO_2 is directly proportional to bicarbonates and inversely to carbonates. Free CO_2 is added to the water as a byproduct of decomposing organic matter, which is common phenomenon in natural waters. Free CO_2 in polluted water is generally high. Permissible limit of Free CO_2 in drinking water is 2 mg/l.

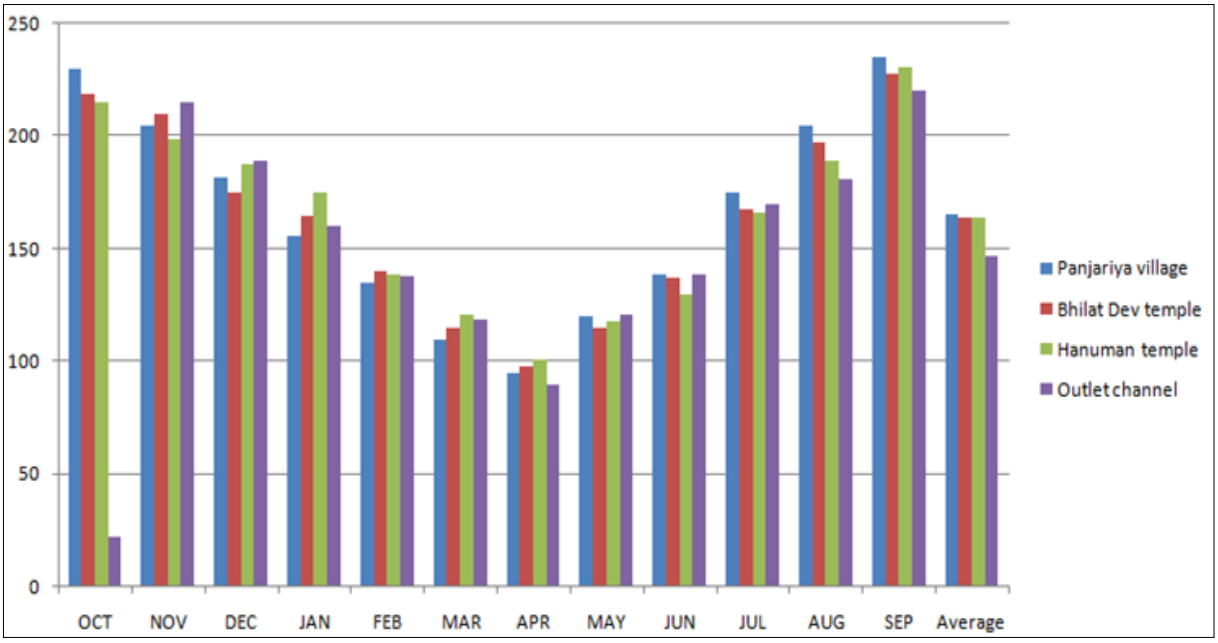
During October 2019 to September 2020 the free CO_2 showed fluctuation between 0 mg/l to 2.98 mg/l with minimum in February 2020 at all the four stations and maximum at station-IV in June 2020 (Figure 5). Nduka *et al.* (2008) [5] also recorded value between 1.00 to 2.20 mg/l in Niger delta of Nigeria.



Graph 5: Showing monthly flunctuation in free CO2 in Sakalda pond

Alkalinity

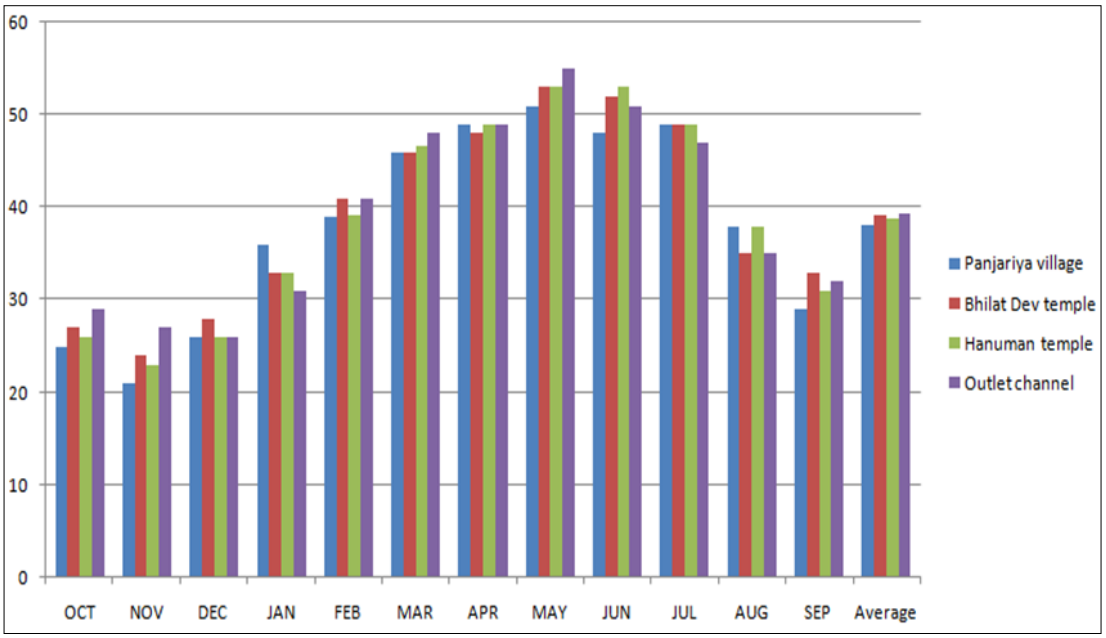
Alkalinity measures the buffering capacity of water and content of CO_2 in its various forms are involved in this carbonate-bicarbonate carbonic acid buffering system. In the present study the value of Alkalinity varied from 22 mg/l to 235 mg/l. The minimum alkalinity of 22 mg/l was recorded at station-IV in October 2019 and maximum of 235 mg/l at station-I in September 2020 (Figure 6). Trivedi *et al.* (2009) [15] also observed the same value in Ganga river India.



Graph 6: Showing monthly flunctuation in alkalinity in Sakalda Pond

Chloride

Chlorides occur naturally in all types of waters, in Natural freshwaters, however, their concentration remains quite low and generally less that of sulphate and bicarbonate. Higher concentration of chlorides is considered to be the indicator pollution due to higher organic waste of the animal origin or industrial effluents. In the present study the value of Chloride varied from 21 mg/l to 55 mg/l. The minimum chloride of 21 mg/l was recorded at station-I in November 2019 and maximum of 55 mg/l at station-IV in May 2020 (Figure 7). Similar results have been observed by Chowdhary (2011) and Siraj *et al.* (2010) [13].



Graph 7: Showing monthly flunctuation in chloride in Sakalda Pond

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