



SEASONAL TEMPERATURE CHANGES AND THEIR INFLUENCE ON FREE CARBONDIOXIDE, DISSOLVED OXYGEN (DO) AND pH IN KHEKARA NULLAH DAM, MAHARASHTRA

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Abstract:

In the present investigation Khekara Nullah (Dam) reservoir was selected at Khapa to study the physico-chemical properties to assess the water quality status. Temperature is one of the most important parameter that regulates the self purification capacity of reservoir. Hence, the measurement of water temperature is of vital importance in the field of water quality assessment. Increase in environmental temperature increases the rate of degradation of organic matter leading to further buildup of carbon di-oxide in water. On the other hand the dissolved oxygen decreases and pH increases. In the present study of Khekara Nullah (Dam) water reservoir two years of observation from November 2011 to October 2013 were recorded. The surface temperature, free carbon di-oxide, dissolved oxygen and pH were recorded 22.1 to 29.8° °C, 1.32 to 5.6 mg/lit, 5.32 to 8.02 mg/lit and 7.6 to 8.4 mg/lit respectively.

Key words: Khekara Nullah Dam, temperature, DO, assessment

Introduction:

Poor land management practices are causing accelerated sedimentation of water bodies. As natural sinks with longer residence times than rivers, the lakes which are relatively more fragile ecologically than the river and susceptible to degradation from such threats. Unless these threats could be controlled and or reduce through better management practices, which also call for appropriate investment decisions, humanity may altogether lose access to these readily available sources with better quality. The rising water consumption has also resulted increase in the release of waste water which is one way and other is contaminating the surface sources. Many of fresh water sources eg. Lakes, reservoir, ponds, streams and rivers etc. are threatened more and more by the unabated discharge of the polluted water from various sources including agricultural wash outs.





Therefore reservoir (dam) needs special attention as they are quite often the catalysts in the development of the region by supplying water for variety of uses. However, many lakes, river were reported to have undergone quantitative and qualitative degradation in the last few decades. Since the behavior of lakes ecosystem depends to a large extent. On its hydrological regime of the lakes is very significant to develop strategies for their conservation, management and rejuvenation. The physico-chemical characteristics of water and the dependence of all life process of these factors make it desirable to take water as an environment.

The present work deals with water quality parameters of the Khekara Nullah water reservoir, Khapa (MS). This water is the sole source of drinking and irrigation for many. The study area Khekara Nullah reservoir is present in the Nagpur district of Viderbha region of Maharashtra and has a predominantly agrarian economy. Khekara Nullah is 50 Kms. far from its Nagpur district, MS. The water reservoir surrounded by dense forest.

Materials and Methods:

Water samples were collected from three sampling spots in the morning hours in the one liter clean plastic bottles at periodic intervals during the year November 2011 to October 2013 as per procedure in A.P.H.A.(2005s) samples were kept in the ice box and transported in the laboratory for estimation of various physico-chemical properties Trivedi & Goel (1994). Water temperature was recorded with the help of centigrade thermometer in°C, while free carbon di-oxide and dissolved oxygen were estimated by Wrinkler's titrometric method. pH of water sample was determined by pH meter in the laboratory.

Environmental temperature fluctuates both and seasonally. It is responsible for heating and cooling of water reservoir. The atmospheric temperature depends upon radiation from the sun as well as on evaporation, relative humidity, and wind, length of day and cloud cover.

Bhosle (2001) reported the water temperature range in between 18°C to 32°C. Lohar et.al (1998) observed a considerable variation in surface water temperature. The temperature of Khekara Nullah reservoir fluctuated between 22.01 to 28.9°C. Seasonal variations were observed in water





temperature which also exhibited a correlation with atmospheric temperature, Kumar (1996). In the present study the surface temperature of Khekara Nullah reservoir were recorded between 21.01 to 29.8°C. Though carbon di-oxide readily soluble in water, very little carbon di-oxide occurs in solution because of small amount of it being present in the atmosphere. Decomposition of organic matter and respiration of aquatic animals and plants contribute to free carbon di-oxide present. It accumulates in large quantities at the bottom of pond, Lake and reservoir due to decomposition of organic matter. Such excess of gas rises to the surface as a mass of bubbles and the gas is lost in the atmosphere.

Result and Discussion:

In summer with an increase in atmospheric temperature, there was corresponding rise in water temperature and consequent increase in biological oxidation of organic matter due to this an elevation in the level of carbon di-oxide (Abbasi 1996), (Singh & Srivastava, 1998). Increase in atmospheric temperature causes an increase in dissolution of carbon di-oxide (Bandela, 1998) showed a direct relationship of free carbon di-oxide with transparency, temperature and pH, while an inverse relation with dissolved oxygen. (Deshmukh, 1964), (Prakash, 1982), Quadri Naveed (2010) and (Lohar & Patel, 1998) showed an inverse relationship of free carbon di-oxide with dissolved oxygen. (Sreenivasan, 1974) reported an inverse relationship of dissolved oxygen with temperature. In the present study of Khekara Nullah reservoir, dissolved oxygen was observed inversely to the temperature, free carbon di-oxide and pH. It was observed that (summer) increase in atmospheric temperature, the water temperature rises and dissolved oxygen decreases, while in winter due to low temperature, the dissolved oxygen increases which ultimately decreases pH of reservoir.

Negative logarithm of the hydrogen ion concentration, it is affected by environmental factors such as temperature, free carbon di-oxide and dissolved oxygen. Increase of temperature causes a light decrease in pH values. At great depths, lowering of the pH, due to high pressure the solution of carbonate formed. Biological factors such as respiration and photosynthesis influence pH changes P. Mohanraj (2010), Bankar (2010).





In the present study (Table-I & Table-II), the pH range was recorded 7.6 to 8.1. High pH range 7.7 to 8.1 was recorded in summer season when free carbon di-oxide level was 5.2 to 5.6 mg/lit and dissolved oxygen 5.32 to 6.84 mg/lit. The low range of pH 7.6 to 8.1 was observed during winter season when free carbon di-oxide level was 1.32 to 3.2 mg/lit and dissolved oxygen 7.14 to 8.02 mg/lit. Thus, close relation between four parameters is evident in Khekara Nullah water reservoir. Increase in temperature, increases the dissolution of atmospheric carbon di-oxide, which in turn affects pH and dissolved oxygen. Higher pH in summer may also be a result of utilization of dissolved carbon di- oxide in primary production (Blum, 1953).

Conclusion:

The seasonal variation in temperature affects the content of dissolved carbon di-oxide, dissolved oxygen and hydrogen ion concentration of the reservoir. As per the drinking water standards (WHO) all the parameters are within the permissible limit. As per pollution status, this water reservoir is free from pollution.

Table-I: Seasonal variations of the temperature, free CO₂, D.O. & pH during Nov. 2011 to Oct. 2012

Season	Parameters	A	B	C
Winter	Temperature	22.1	22.07	22.02
	Free CO ₂	2.2	1.32	1.32
	D.O.	8.02	8.02	7.83
	pH	7.6	7.7	7.9
Summer	Temperature	27.1	29.8	27.9
	Free CO ₂	5.2	5.4	5.6
	D.O.	6.58	6.6	6.84
	pH	7.8	7.6	7.7
Monsoon	Temperature	26.18	26.28	26.0
	Free CO ₂	2.9	1.32	1.54
	D.O.	7.83	7.83	8.02
	pH	7.9	7.7	8.1





Table-II: Seasonal variations of the temperature, free CO₂, D.O. & pH during Nov. 2012 to Oct. 2013

Season	Parameters	A	B	C
Winter	Temperature	21.1	22.02	22.01
	Free CO ₂	2.1	1.45	3.2
	D.O.	8.0	8.02	7.14
	pH	7.7	8.1	8.1
Summer	Temperature	27.8	27.7	28.1
	Free CO ₂	5.4	5.3	5.2
	D.O.	5.33	5.32	5.38
	pH	8.3	8.1	7.9
Monsoon	Temperature	26.0	26.09	24.5
	Free CO ₂	2.3	2.2	3.2
	D.O.	7.80	7.83	6.95
	pH	8.4	8.3	8.2

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