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INFLUENCE OF CIRCADIAN RHYTHMS ON PHYSICO-CHEMICAL PARAMETERS OF SIDDHESHWAR TEMPLE TANK IN SOLAPUR (M.S)

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Abstract:-Changes in circadian rhythms of physico-chemical parameters were studied from a freshwater tank, Siddheshwar temple tank from Solapur city. Diurnal changes in temperature, pH, dissolved oxygen, total hardness, total alkalinity, calcium, ammonia and turbidity were studied during October - December 2012. The aim of the study was to identify the influence of diurnal variations on these parameters. The diurnal changes were observed by significant increasing / decreasing patterns at an interval of eight hours. The dissolved oxygen content was fluctuated in twenty four hour cycle. This parameter showed increasing trend during night hours. Calcium content of water gradually increased from respective months. Turbidity was found to be significantly increased during night hours. This parameter has followed increasing trend consistently during the year 2012.The circadian rhythms play a major role in fluctuating physico-chemical parameters.

Keywords: Physico-Chemical , temperature , Circadian Rhythms , Siddheshwar Temple .

INTRODUCTION:

Circadian rhythms or diurnal cycle is a Twenty Four hour rhythmic cycle. It is established and influenced by solar radiations. Diurnal cycle is also influences biotic as well as abiotic factor among all ecosystems. Sinha et al., (1993) have studied circadian variations in freshwater pond in Ranchi. They studied the effect of this circadian rhythms on biotic factors that on phytoplankton and zooplanktons. In the present study an attempt to record changes that occurred during Twenty Four hours of day and how these circadian rhythms affects the pattern of physico-chemical factors. ..

The Siddheshwar temple tank is located in Solapur city. This tank is located around Siddheshwar temple, which is having history of about 800 years. Every year there is a famous Gadda yatra on the occasion of "Makar Sankranti" in the month of January. A month long Gadda yatra organised in Solapur. Lacks of devotee visit this Gadda yatra. During these days this tank is subjected to various human interventions such as boating, activities of devotee. About thousands of tons of "Nirmalya" that is stuffs used for worship of god were released without any proper scientific treatment into this tank. These human activities greatly interfere with tank's natural beauty and balance.

In the present investigation, an attempt has been made to study alterations and changes caused due to diurnal cycle of this tank. Some prominent workers (Micheal; 1964 ,. Turkoglu and . Erdogan; 2002) conducted their study on diurnal aspect. The aim of this study is to determine influence of diurnal variations on the physico-chemical parameters of the Siddheshwar temple tank.

MATERIALS AND METHODS

The study area for the investigation is located in Solapur city. The Siddheshwar temple tank is located in (Lat170 40.329'N; Long 0750 54. 235'E) in the heart of the city. The Siddheshwar temple tank is very much influenced by temple activities, boating and the load of devotee visiting the temple. To determine the physico-chemical parameters, water samples were collected from fixed sampling spots. For experiment, water samples were collected during Twenty Four hour cycle from October 2012- December 2012 at an interval of 15 days of each month and 8 hours interval on particular day of collection. The various physico-chemical parameters were estimated as follows:

a)Air and water Temperature was determined on the spot by using standard Mercury Thermometer.
b)pH of water sample was done with the help of standard pH meter (Elico, India)
c)Turbidity was determined by using standard turbidometer.
d)The dissolved oxygen, total hardness, total alkalinity, chlorides, calcium and ammonia were determined by methods described in APHA (2005).

Photo graphs of site:

PHOTO 1

Study Site : Siddeshwar Temple Tank

Gadda Yatra

Human Activity: Boating

RESULTS

The diurnal variations in physico-chemical parameters were shown in table: No 1.

Variations in Physico-chemical parameters from Siddheshwar Tank during October- December 2012

Sr No	Parameters	Month 15 Oct 2012			Month 30 Oct 2012			Month 12 Nov. 2012			Month 30 Nov. 2012			Month 12 Dec. 2012			Month 28 Dec. 2012		
		At 6:00 am	At 2:00 pm	At 10:00 pm	At 6:00 am	At 2:00 pm	At 10:00 pm	At 6:00 am	At 2:00 pm	At 10:00 pm	At 6:00 am	At 2:00 pm	At 10:00 pm	At 6:00 am	At 2:00 pm	At 10:00 pm	At 6:00 am	At 2:00 pm	At 10:00 pm
1	Air Temperature(^{0}C)	30.1±0.15	32±0.10	24±0.40	30.7±0.88	34±0.10	27±0.20	21±0.10	25±0.20	20±0.30	22±0.10	24±0.30	19±0.15	18.5±0.10	21±0.20	19±0.30	20±0.10	24±0.30	19±0.40
2	Water Temperature(^{0}C)	28±0.10	30±0.20	21±0.03	30±0.10	32±0.30	24±0.40	19±0.30	23±0.10	16±0.20	19±0.40	21±0.20	18±0.10	16±0.20	18±0.10	15±0.20	18±0.30	20±0.10	18±0.10
3	pH	7.1±0.10	8.4±0.20	6.5±0.30	8.2±0.10	8.4±0.40	8.4±030	7.7±0.20	7.8±0.10	8.6±0.30	7.6±0.40	8.0±0.15	8.3±0.10	8.2±0.20	8.4±0.20	8.5±0.05	8.1±0.10	8.2±0.15	8.3±0.25
4	Dissolved Oxygen (ppm)	6.6±0.50	4.6±0.40	8.3±0.40	3.6±0.15	6.1±0.20	7.0±0.20	2.9±0.20	6.7±0.30	6.1±0.10	4.8±0.35	3.7±0.45	6.2±0.10	5.0±0.20	4.9±0.10	6.1±0.30	3.1±0.10	5.1±0.40	6.8±0.10
5	Total Hardness(ppm)	372±02	266±01	348±08	400±05	398±08	349±01	323±03	298±07	249±01	299±08	329±02	324±04	373±03	291±08	332±11	410±07	386±02	399±01
6	Total Alkalinity(ppm)	148±14	174±08	99±03	78±01	78±05	68±02	279±09	140±01	128±06	98±02	129±08	119±10	108±02	109±05	139±07	139±01	129±06	148±04
7	Calcium(ppm)	144±07	200±10	160±20	168±09	169±04	210±06	149±07	172±02	174±04	172±09	149±04	89.5±13	249±05	283±03	300±08	300±01	424±04	344±03
8	Chlorides(ppm)	324±04	349±09	323±03	300±15	349±02	349±06	323±10	249±01	323±03	323±08	399±05	350±08	399±01	399±03	373±07	373±02	350±12	249±06
9	Ammonia(ppm)	3.3±0.30	0.02±0.01	0.02±0.01	0.6±0.20	1.6±0.50	1.4±0.20	0.4±0.20	1.1±0.10	0.5±0.40	0.4±0.10	0.1±0.13	0.2±0.17	1.3±0.30	0.2±0.10	0.4±0.30	0.2±0.10	0.06±0.01	1.6±0.20
10	Turbidity(NTU)	11.8±0.20	15.0±0.50	18.5±0.20	19.6±0.20	18.6±0.40	19.0±0.10	18.5±0.40	19.3±0.30	29.5±0.50	19.5±0.20	29.5±0.10	14.8±0.30	19.5±0.50	29.5±0.50	19.5±0.30	17.8±0.20	27.8±0.40	15.0±0.20

Temperature showed noticeable variation during the study. Both air and water temperature showed maximum increase during afternoon hours and sharp decrease during night hours. Temperature is an important parameter which influences the daily activities of aquatic animals. Jindal and Thakur (2013) they carried out diurnal studies on plankton and physico-chemical characteristics of Rewalsar wetland, Himachal Pradesh, noticed that water temperature showed a definite diurnal trend of increment during day time. According to Welch (1952) smaller water bodies more quickly reacted to changes in temperature.

pH varied between 7.1-8.6 during the study. pH of water body is found to be alkaline in nature. Tiwari and Ranga M.M (2012), while assessing diurnal variation of Khanpura Lake, Ajamer observed the increase in pH from January to June and they noticed that generally pH values were maximum during 2 pm and 6 pm while minimum values during 2 am to 6 am that is in the dawn hours.

Dissolved oxygen showed maximum fluctuations during entire investigation. Dissolved oxygen showed sharp increase in night hour, it showed fluctuating pattern in morning and afternoon hours. Dissolved oxygen varied between 2.9 ppm-8.3 ppm. Ingole et al., (2009) noticed an inverse relationship between water temperature and dissolved oxygen while carrying out study on Majalgaon dam and several other workers (Agarwal and Thapliyal, 2005) observed the same relationship. Similar results were recorded in present investigation.

Total hardness varies between 266 ppm-410 ppm from the tank during 2012. This parameter showed a sharp increase in the morning and night hours than afternoon period. This increase might have caused by increased load of pollutant matter from human activities. Sultana et al., (2009) have studied the physico-chemical parameters and presence of some trace metals from Chrompet Lake, Chennai have noticed total hardness in water ranged from 300 ppm-778 ppm. These ranges were found to be well above permissible limits of WHO guidelines.

Total alkalinity fluctuated between 68 ppm-279 ppm during study. This parameter shows no definite pattern of increasing and decreasing trends. However, it remained higher during November 2012- December 2012.Ayode et al., (2009) recorded total alkalinity in winter season. This may be due to biological activity of water, during their investigation of two regulated High altitude river in Himalaya, India. Similar results were recorded in present study.

The calcium content of water is fluctuated between 89.5 ppm – 424 ppm. Calcium is found to be gradually increased from October 2012-December 2012. It showed maximum increase in December 2012. According to Nataraja et al., (2009) calcium is an important element which associates with carbonates, bicarbonates, fluorides to exert hardness.

Chlorides in water varied between 249 ppm-399 ppm. This parameter showed no significant increasing or decreasing trends. According to Hasalam (1991) chloride contents are richer in sewage water and industrial effluents. Discharge of such waste will result in greater amount of chlorides in fresh waters.

Ammonia content in water fluctuated between 0.02 ppm-3.3 ppm. The maximum limit of ammonia was recorded in October 2012 during morning. Consistent minimum ammonia content was recorded in November and December 2012. According to Ananthan (1994) and Rajsekar (1998) this fluctuation may be due to death of phytoplankton followed by their decomposition and also by excretion of ammonia by planktonic organisms.

Turbidity values vary between 11.8 ppm-29.5 ppm. Higher values of turbidity were recorded in November 2012-December 2012 compared to the October 2012. This might be load of pollution during the investigation. Jawale et al., (2009)

while carrying out investigation on Terna Makni reservoir observed that turbidity depends on rainfall in monsoon periods..

CONCLUSION

From our study, it is observed that physico-chemical parameters vary with diurnal variation through fixed intervals of day and time. Relatively higher values of total hardness, calcium and turbidity may be due to polluted status of this tank. However, local temple management banned any discharge of "Nirmalya" and to take "Holy Bath" in tank. And management also constructed barriers making all the sites of this tank inaccessible for local people and devotee to enter. This attempt is to protect and to conserve this beautiful natural tank for conservation of Siddheshwar temple tank. This safety strategy of the lake initiated by temple authority is highly appreciable. However, devotees and local people contribution in conserving the prestigious, historical, ancient and ecologically significant Siddheshwar temple tank needs to be protected.

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