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IMPACT OF PHYSICOCHEMICAL PARAMETERS IN SUMMER SEASON ON WATER OF LAKE NAKKI, MOUNT ABU (RAJASTHAN), INDIA

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ABSTRACT

In present study attempt has been made to study the impact of physicochemical parameters on water quality especially in summer season of Nakki lake, Mount Abu (Raj.), India. Water samples were collected from selected three stations during summer season (March-June) for analysis of physicochemical parameters such as air and water temperature, transparency, pH, total hardness, total alkalinity, dissolved oxygen and chemical oxygen demand. The obtained results were compared with Standard values and it was found that the average values of pH and dissolved oxygen at station 2 and station 3 and COD at all stations (S1, S2 and S3) respectively, were found above the permissible limits for drinking water proposed by World health Organization and Bureau of Indian Standard. Some parameters at different stations were found nearby the permissible limits. This reveals that lake Nakki water was alkaline with high pH values, low dissolved oxygen level and high COD. The study of water quality of Lake Nakki is of significant value because this is the only resource of water supply in dry days to occupiers of Mount Abu. The present research specified that the Nakki lake water is trending towards polluted state with reference to examined parameters.

KEYWORDS: Mount Abu, Nakki Lake, Physicochemical Parameters, Summer Season, Standards

Mount Abu is the hill station near Sirohi, Rajasthan, India, which is extensively enriched with biodiversity, Aravalli hills and ancient temples. It is also the location of highest situated lake of Rajasthan that is Nakki lake. It is at an altitude of 1220 meters from sea level. Nakki lake is the ancient and sacred lake situated in the center of Mount Abu, Rajasthan. The lake is the most attracted place in the Mount Abu and holds a great mythological story with its origin and this proves the sacredness of the lake. It is located in 24º 35'N latitude and 72º 42'E longitude.

Nakki Lake is valuable for different aspects such as, source of drinking water, encourage wild life in and around the lake and also boost up local people economically. City dwellers of Mount Abu get their drinking water supply from upper and lower kodra dam, but when in dry days there is no enough water left in dams, then the only source of drinking water supply is lake Nakki water. Therefore, present research has accompanied to explore effect of physicochemical parameters (in summer season) on water quality of Lake Nakki, Mount Abu (Rajasthan).

MATERIALS AND METHODS

Study Area

Nakki lake is the freshwater lake. The lake is mainly surrounded by mountains and also known as heart of Mount Abu. The depth of the lake is 12.25m. with rocky bottom and has a total round off periphery of about 3km. Nakki Lake has a water holding capacity of about 270 million gallons. The main source of water in Nakki lake is rain-run off from surroundings and few seasonal nala's.

Sample Collection

The Surface water samples were collected in summer season (March-June) 2019 from three station of Nakki lake – (1) Middle of the lake (2) Opposite to Lake Palace hotel and (3) Tourist spot (I love Mt. Abu). Water sample were collected in morning hours and for each parameter separate sterilized bottle, already tagged with stations name was taken. For dissolved oxygen samples were collected in BOD bottles of 300ml capacity. Dissolved oxygen samples were fixed immediately on the spot (Trivedy and Goel; 1986).

Sample Analyzing

Selected Physicochemical parameters taken up for the study are air and water temperature, transparency,

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pH, total hardness, total alkalinity, dissolved oxygen and chemical oxygen demand (COD). Temperature (air and water) and Transparency was measured on the spot by mercury thermometer and secchi disc (20cm diameter) respectively at each sampling stations. pH was measured by Systronics digital pH meter. Total hardness (EDTA Titration), total alkalinity (methyl orange indicator method), dissolved oxygen (Winkler method) and C.O.D. (reflux method) was estimated by following standard titration methods (Trivedy and Goel; 1986), (APHA; 1989).

For Statistical analysis, three readings per month for every parameter was taken and mean of this was statistically analyzed by Standard deviation of different station (S1, S2 and S3) of the Nakki lake.

RESULTS AND DISCUSSION

Summer fluctuations in the values of various physicochemical parameters at each three stations, and their mean and observed range have been given in the Table 1.

Table 1: Mean values of various physicochemical parameters of different stations of Nakki Lake, Mount Abu.

Summer Season						
Parameters	**S1**		**S2**		**S3**	
	Mean ± SD	**Range**	**Mean ± SD**	**Range**	**Mean ± SD**	**Range**
Air temp. (℃)	25.5 ± 2.38	24-29	24.25±4.11	19-29	24.5 ±3.70	20-29
Water temp. (℃)	20.75± 3.40	16-24	20 ±2.71	16-22	20.75± 3.40	16-24
Transparency(cm)	42.50±1.91	40-44	42.13 ±11.81	31-57	41.50 ±13.63	28-59
pH	8.02 ±0.70	7.27-8.79	8.11± 0.41	7.52-8.45	8.05 ±0.76	7.30-8.94
Total hardness (mg/l)	43.00±12.67	28.66-56.66	49.16±12.79	32.66-62.66	52.83±16.33	35.33-68.66
Total alkalinity (mg/l)	178.33±5.77	173.33-183.33	158.33 ±10.00	146.33-163.33	140.83± 23.63	123.33-173.33
D.O. (mg/l)	6.26 ±1.21	4.53-7.33	4.93± 0.57	4.53-5.73	3.96±0.70	3.33-4.93
C.O.D. (mg/l)	167.50± 35.94	140-220	192.50± 55.60	140-270	217.50 ± 51.23	170-290

Table 2: Standards of drinking water

Parameters	WHO	BSI
pH	6.5-8.5	6.5-8.5
Total Alkalinity	200	200
Total Hardness	200	200
DO	4	4
COD	10	10
All parameters are stated in mg/l except pH		

Air and Water Temperature

Temperature is one of the important influences which regulate biogeochemical activities in aquatic conditions (Kumar; *et al*., 1996). The recorded air temperature during study period, March-June 2019, ranged from 24 to 29℃ at Station 1, from 19 to 29℃ at Station 2 and from 20 to 29℃ at station 3. From selected three stations, the maximum air temperature was recorded in month of June and minimum in March of summer season. Water temperature influences aquatic weed, algal growth and nearby air temperature (Senthikumar and Sivakumar; 2008). The recorded average water temperature of Lake Nakki varied from 16 to 24℃ at Station 1, from 16 to 22℃ at station 2 and from 16 to 24℃ at Station 3. Maximum water temperature recorded was 24℃ in June.

Transparency

Water transparency of Nakki lake in summer season were recorded almost similar at three stations. The recorded average values are42.50 cm, 42.13 cm and 41.50 cm at station 1, Station 2 and Station 3, respectively. Lowered transparency during summer may be corelated with the concentrations of inorganic substances (Ara and Jamil; 2020).

pH

The average value of pH at three station showed an alkaline nature of lake in summer season. The observed mean values were 8.02, 8.11 and 8.05 for the Station 1, Station 2 and Station 3 respectively. The higher range of pH indicates higher productivity of water (Khan and Khan, 1985). Maximum values of pH during summer may be due to low water level and concentration of nutrients in water. Identical results in summer season has been reported by (Rawal *et al*; 2018). The maximum value of pH range was 8.94 at station 3 in May and minimum 7.27 at station 1 in June.

Total Hardness

The total hardness of Nakki lake was found in the range from 28.66 to 56.66 mg/l at Station1, from 32.66 to 62.66 mg/l at Station 2 and from 35.33 to 68.66 mg/l at Station 3, respectively. The maximum total hardness was 68.66 mg/l at Station 3 in May and minimum 28.66 mg/l at Station 1 in March. Increase trend of hardness in summer can be attributed to the low water level and high rate of evaporation at higher temperature (Medudhula *et al*; 2012).

Total Alkalinity

During the study period, variation was noticed in the values of total alkalinity of Lake Nakki, were found within the range from 173.33 to 183.33 mg/l at Station 1, from 146.33 to 163.33 mg/lat Station 2 and from 123.33 to 173.33 mg/l at Station 3. The maximum and minimum values were found at Station 1 in June and Station 3 in March respectively. Verma *et al* (2012) found maximum value of alkalinity in summer season. According to them increase value of alkalinity in summer season can be attributed to the decrease level of water noticed in numerous lakes that results into death and decay of living plants and living organism. Thus, decomposition occurred resulting into accumulation of carbonate and bicarbonate in the lake water.

Dissolved Oxygen

Dissolve oxygen plays a major role in regulating aquatic organism life. The recorded average value of dissolved oxygen at different station of Nakki lake was 6.26 mg/l at Station 1, 4.93 mg/l at Station 2 and 3.96 mg/l at Station 3, respectively. This result showed that dissolved oxygen at Station 1 was found to be relatively higher as compared to Station 2 and Station 3. Low dissolved oxygen was noticed at Station 3 could be due to addition of large quantity of sewage and high pollution load. Similar observation was found in summer season by Rawat and Trivedi in their findings on Dholawad Dam of Ratlam District M.P. Mohmmed *et al* (2009) also recorded low oxygen level during summer season mainly due to the elimination of free oxygen through respiration by bacteria and other animals.

Chemical Oxygen Demand

The average values for COD were ranged between 140 to 220 mg/l at Station 1, 140 to 270 mg/l at Station 2 and 170 to 290 mg/l at Station 3. Average value of COD at all Stations indicates the pollution due to oxidable organic substances (Rawal *et al*; 2018).

CONCLUSION

Wide variation was observed in physicochemical parameters in different stations of Nakki lake during summer season. On comparing the data of summer months fluctuations of physicochemical parameters at Station 1, Station 2 and Station 3 of lake Nakki (Table-1) with National and International standards (WHO) and (BSI) given in Table-2, reveals that the total hardness values of each three station was within the permissible limit of drinking water standards. The pH and total alkalinity ranges of sampling stations found at the border line of permissible limits. Average value of dissolved oxygen at station 3and pH at station 2 was found beyond the limits of (WHO) and (BIS) and higher values of COD than permissible limits (10mg/l) were found at each station (S1, S2 and S3) indicates pollution due to oxidable organic matter, respectively. Output of this investigation reveals that the water quality of Nakki lake in summer season is trending towards the pollution state at station 3 than station 2 and station 1.

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