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RESEARCH ARTICLE

STUDIES ON PHYSICO-CHEMICAL CHARACTERISTICS OF DAL LAKE, SRINAGAR KASHMIR

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ABSTRACT

This study was aimed to estimate currentstatus of physico-chemical characteristics of Dal Lake at Srinagar District, Kashmir. Monthly changes in physico-chemical parameters such as water temperature, transparency, pH, conductivity, dissolved oxygen, Free Co_2, Alkalinity, chlorides, Ammonical nitrogen, Nitrate nitrogen and Total phosphorus were analyzed for a period of one year from January to December 2011. Among various Physico chemical parameters water temperature varied from 4.8°C to 25.6°C, transparency from 0.72 m to 1.66 m, pH of water was on alkaline side (7.34 to 8.2)., Conductivity ranged from 292.4 µs/cm to 406.2µS/cm, dissolved oxygen from 4.7 mg/L to 7.9 mg/l, free carbon dioxide from 08.80 mg/L to 20.50mg/L, total alkalinity from 130.70 mg/L to 181.00 mg/L. During the study period, higher values of ammonical nitrogen were recorded during summer and lower during winter season, nitrate nitrogen values recorded were in the range of 365.1 µg/L to 607 µg/L. Lower values of total phosphorous were observed during winter season and higher during Autumn season.

INTRODUCTION

Water is the most essential and one of the prime necessities of life. No one can live without water (Khanna *et al*., 2007). Fresh water bodies particularly lakes are subjected to various natural processes taking place in the environment, such as the hydrological cycle. Surface water runoff and discharge of sewage into the lakes are two common ways by which various nutrients enter the aquatic ecosystems resulting in the death of those systems (Sudhira and Kumar, 2000). The valley of Kashmir is well known for its huge fresh water resources like lakes, glaciers, rivers, ponds, springs etc. The Dal lake of Kashmir, situated in the north- east of Srinagar has been a great tourist attraction in the past. However, once beautiful water body has been the worst victim of the anthropogenic pressures during the second half of the 20th century. Inspite of being the centre of Kashmir civilization, the lake has suffered numerous insults in the hands of man, as a result is moving towards its definite end. The lake is undergoing rapid trophic evolution as it is under great ecological stress due to fast urbanization in its surrounding areas. It also receives huge amount of untreated sewage and solid garbage from the dense population resulting in the form of weed infestation besides obnoxious algal bloom. Due to the ecological stress from human activities, the lake system is not only shrinking in surface area but its water quality has also deteriorated and the aquatic life is also badly affected. This prompted us to study the physico-chemical properties of this water body for a period of one year.

MATERIALS AND METHODS

Study Area

Dal Lake, the urban valley lake of fluviatile origin is situated at an altitude of 1886m (ASL)between 34º5-34º6´ N latitude and 74º8´-74 º 9´ E longitudes, in the heart of Kashmir Valley on the northeast of the state summer capital Srinagar at the foot of Zabarwan Mountains (Fig 1). The total water surface area of the lake is 11.56km², whereas the total volume estimated is 9.05×10 m³ and the ratio between the mean and maximum depth (m) ranges between 0.20m and 0.25m indicating the gentle slope of the lake bed. This open drainage eutrophic lake is multibasined with the Hazratbal, Bod-dal, Gagribal, Brarinambal and Nigeen as its five basins, which differ markedly in their area, volume, depth and shoreline development indices etc. Five (5) sites were selected for the present study. The selected sites are SI (Telbal), SII (Hazratbal), SIII (Nigeen), SIV(Centaur), and SV (Brarinambal) as shown in (Figure 1)

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METHODOLOGY

Water samples for physico- chemical Characteristics were collected on monthly basis from January 2011 to December 2011 at five sampling sites. Temperature and Transparency were measured in the field. Dissolved oxygen sample was fixed at the spot in accordance with winkler"s method. pH of the water was determined by electrometric method using a laboratory pH meter. Conductivity was measured by digital Conductivity metre. Free CO_2, Total alkalinity,Chloride, ammonia, nitrate and total Phosphorus were determined separately, for five samples, in the laboratory, employing methods given in Mackereth *et al.* (1978) and APHA (1998). The average (mean) for each parameter per month was computed, considering the values from five stations.

RESULTS AND DISCUSSION

Range of variation and their mean along with standard error of various Physico-chemical characteristics of water of Dal lake, Kashmir have been given in (Table 1). Water temperature is one of the most important limnological parameters that plays a prominent role in regulating nearly all physico-chemical characteristics of water as well as biological productivity (Wetzel, 1983) & also in controlling the nutrient input and turnover. The average monthly water temperature fluctuated between a minimum of 4.8 °C in January to a maximum of 25.6 °C in August with an annual mean of

16.43±2.22 °C. The variation in the temperature of the present study is in broad agreement with the findings of Rao *et al.* (1982) for Nainital lake (8 ^{0}C to 23 ^{0}C), Billore and Vyas (1982) for Pichhola lake (0.6 to 26.3 ^{0}C) and Siraj *et al*. (2004) for Dal lake. Transparency in the present study ranged from 0.72 m in june to1.66 m in January with an average of 1.1442 ± 0.0867 m. Higher values of transparency in winter may be attributed to low biological activity (Pandit and Rather, 2006) and sedimentation of suspended particles (Spur, 1975). Throughout the lake the transparency was generally, low which may be attributed to increased silt load and suspended matter brought in from the catchments area as well as due to rich macro- vegetation (Siraj *et al.,* 2004). pH is considered as one of the most important chemical parameter of water since most of the aquatic organisms are adapted to an average pH. The pH values in the present study ranged from 7.34 to 8.82 with an average of 7.84±0.43. Higher value 8.82 was recorded in the months of june and july while the lower value of 7.34 in January. The lower values of pH during winter months may be attributed to decomposition of macrophytes (Siraj *et al.,* 2004). Electrical conductivity is an index of the total nutrient level of a water body. Conductivity was found to fluctuate from 292.4µs/cm in May to 406.2µs/cm in September with an average of 328.5 ± 10.8 µs/cm. The relatively lower values of conductivity during summer could be related to the uptake of ions by Autotrophs during their peak growth in summer (Pandit and Rather, 2006) while higher values in Autumn can be attributed to decomposition of organic matter.

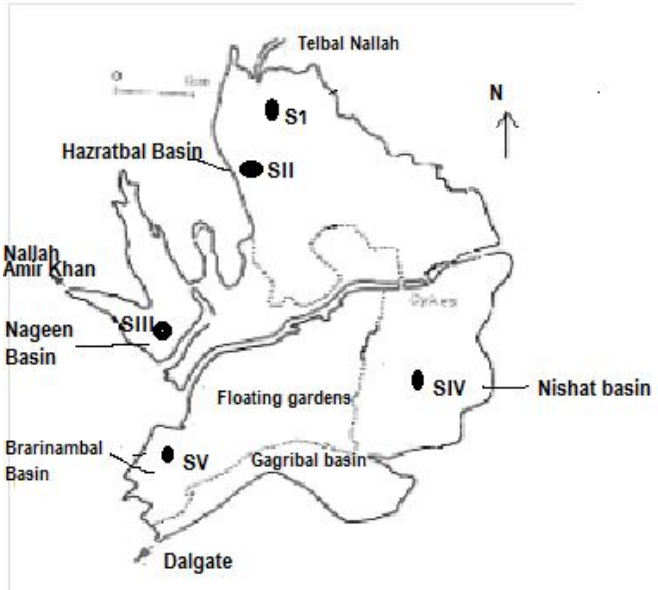

Figure 1. Map of study area showing location of different water sampling stations

Dissolved oxygen is one of the most reliable parameters in assessing the trophic status and the magnitude of eutrophication in an aquatic ecosystem. In the present study, the average concentration of dissolved oxygen in Dal Lake varied from 4.7 mg/l in August to 7.9 mg/l in April. The Dissolved oxygen was found to be higher in spring and the lower in summer (August) season. High dissolved oxygen concentration during spring season may be attributed to vigorous photosynthetic activity by autotrophs (phytoplankton & submerged vegetation) and lower dissolved oxygen content towards the Autumn season could be the result of increase in water temperature and increased rate of decomposition (Ganie *et al.,* 2012 and Kumar *et al.,* 2004). Free CO_2 in the present study varied from 08.80mg/L to 20.50mg/L with a mean value of 14.25±1.05 mg/L. The free carbon dioxide was high during winter (January) and low during Autumn (August). The high concentration of free CO_2 during winter may be attributed to decomposition of organic matter while as low concentration of free CO_2 during Autumn season could be due to high photosynthetic activity by Autotrophs (Yousuf *et al.*, 1986).

Table 1. Physico-chemical characteristics of Dal lake, Kashmir during 2011

S. No	Parametres	Min	Max	Mean±SE
1	Air Temperature (0_C)	7.00	32.20	20.70±2.41
2	Water Temperature (0_C)	4.80	25.60	16.43 ± 2.03
3	Transparency(m)	0.7200	1.6600	1.1442 ± 0.0867
4	pH	7.8000	8.8000	8.2750 ± 0.0978
5	Conductivity(µs/cm)	292.4	406.2	328.5 ± 10.8
6	Dissolved O2(mg/l)	4.700	7.900	6.283 ± 0.336
7	Free CO_2 (mg/l)	8.80	20.50	14.25 ± 1.05
8	Total Alkalinity (mg/l)	130.70	181.00	149.75 ± 5.64
9	Chloride (mg/l)	19.70	32.30	27.62 ± 1.04
10	Ammonical Nitrogen(µg/l)	284.7	415.4	358.8 ± 12.0
11	Nitrate nitrogen(µg/l)	365.1	607.2	465.7 ± 20.2
12	Total Phosphorus (µg/l)	604.0	944.2	773.4 ± 31.0

The total alkalinity ranged from 130.70mg/L to 181.00 mg/L with an average of 149.75 ± 5.64 mg/L, of which maximum value181.00 mg/L was observed in winter season and minimum value of 130.70mg/L in summer season. This is in agreement with the findings of Agarwal and Thapliyal (2005) in Bhilangana. Chloride concentration in freshwater is generally due to salts of sodium, potassium, magnesium and calcium. In the present study, the values of chlorides fluctuated between 19.70mg/L to 32.30 mg/L with an average of 27.62 ± 1.04 mg/L (Table 1). The higher concentration of chloride may be attributed to the organic pollution of Animal origin and domestic wastes (Thresh *et al.,* 1944, Ara *et al.,* 2004, and Ganie *et al.,* 2012). The concentration of Ammonia is usually low in aerobic water because it is utilized by plants. During the investigation period, the ammonical nitrogen values were recorded in the range 284.7 mg/L to 415.4 mg/L with an average of 358.8 ± 12.0 mg/L (Table 1). Higher values were recorded during winter and lower during summer season. Since the values of ammonical nitrogen are quite high in the lake, they are suggestive of high degree of sewage pollution in the lake. Nitrate is the common form of inorganic nitrogen entering fresh water from the draining basin, ground water and precipitation and mostly occurs in low concentration (Wetzel 1983). During the present study higher concentrations of nitrate (607 µg/l) was recorded in September whileas Lower concentration (365.1µg/l) was recorded in May.High concentrations of Nitrate during autumn is in conformity with the observations of Sondergard *et al.,* (1979). Low concentration of Ammonia may be attributed to its locking up in luxuriant macrophytic population. Phosphorous is regarded as the key element in the eutrophication process. During the present study, concentration of total phosphorous ranged from 604 µg/l in January to 944.2 µg/l in September. Higher concentration of phosphate in dry seasons may be due to low level of water and pollution. From the present study on physico- chemical parameters of Dal lake it can be concluded that Dal lake is significantly advanced in its trophic status and at present showing eutrophic status.

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REFERENCES

Agarwal N. K. and Thapliyal B. L (2005). Preimpoundment hydrological study of Bhilangana River from Tehri Dam reservoir area in Uttaranchal. *Enviromental Geochemistry* 8 143-148.

A. P. H. A. (1998) *Standard Methods for Examination of water and wastewater. 20th* Ed. American Public Health Association, Washington, D.C.

Ara, S., Khan, M.A. and Zargar, M.Y. 2004. Physicochemical characteristics of Dal lake. *Water Poll*. by Professor Arvind Kumar, A.P.H. Publishing Corp. 5. Ansari Road, Darya Ganj, New Delhi – 11002, pp. (159-164).

Billore D. K and Vyas L.N (1982). Distribution and production of macrophytes in Pichhola lake, Udaipur (India). p. 45-54. In: *Wetlands Ecology and Management,* Edited by B. Gopal, R.E. Turner, R.G. Wetzel and D. F. Whigham (*National Institute of Ecology and International Scientific Publications*, India).

Ganie, M. A., Khan, M.I and Parveen, M. (2012). Seasonal variations in physico-chemical characteristics of pahuj reservoir, district jhansi, bundelkhand region, central india. *International Journal of Current Research Vol. 4, Issue, 12, pp.115-118.*

Khanna, D. R., Singh, V., Bhutiani, R., Kumar, C. and Matta, S. (2007). A study of biotic and abiotic factors of Song River at Dehradun, Uttarakhand.

Mackereth, F.J., Haron, J. and Talling, J.F. (1978).Water analysis. *Freshwater Biol. Assoc. Sci. Publ.* No. 36.

Pandit, A. K and Rather, G. H (2006). Nutrient status of Ahansar lake Kashmir Himalaya. J. Himalayan Ecol. Sustain. Dev. Vol. 1 pp 87- 89.

Rao N G, Ragavan SL and David A (1982). Limnology of selected village ponds in Bangalore district of Karnataka, Mysore. *J. Agri. Sc.* 16: 183-200.

Siraj, S., Yousuf, A. R., Bhat, F. A and Parveen, M. (2006). Cladoceran Community of Dal Lake, Kashmir. proc. nat. acad. sci. india, 76 (b), IV.

Sondargard, M. and Sand-Jensen, K. 1979. Limnology of kalgaard (Denmark). *Hydro.* 63(3): 241-253.

Spurr, B. 1975.Limnology of Bird Pond, Ross Island, Antartica. *N. Z. J. Mar. Freshwater res.* 9(4): 547-572.

Thresh, J.C., Suckling, E.V. and Beale, J.E. 1944. The examination of water and water supplies. 6th Ed. (F.W. Taylor, Ed.) London.

Sudhira H. S. and Kumar V. S. (2000) Monitoring of lake water quality in Mysore city. In T. V Ramachandra, M. C. Rajasekara and N. Ahalya (Eds.) *International Symposium on Restoration of Lakes and wetlands:* Proceedings of lake. Bangalore, India; Centre for Ecological Sciences,Indian Institute of Sciences.1-10

Yousuf, A.R. and Qadri, M.Y. 1986. Distribution of *Polyarthra vulgaris carlin* (Rotifera: Monogononta) in a warm monomictic lake of Kashmir, India. *J. Indian Inst. Sci.*66: 405-410.

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