JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Various Physico chemical Characteristics of Ahansar Lake , Kashmir

Dr.Irfan Jamila

Associate Professor

Department of Zoology ,Govt women college , M.A .Road , Srinagar,190001

E-mail address:- irfanjamila@yahoo.com

Abstract

The present Research work has been carried out to evaluate various physico-chemical characteristics of Ahansar Lake (District Bandipora) Kashmir . Water samples were collected monthly from two different sampling sites for a period of two years during 2018 -2020 . Correlation between certain parameters were made . Positive correlation between temperature and pH was recorded . Negative correlation between temperature and Oxygen , pH and carbon dioxide were obtained . Results revealed that the water of Ahansar lake is " alkaliphilous" and "Calcium rich water" . Carbonates were absent due to continuous oxidation of organic matter . Conductivity values were >300 µS which indicate that the lake water is eutrophic .

Key words :- Alkaliphilous , Calcium rich water , Correlation ,Conductivity ,Physico –Chemical

1 .Introduction

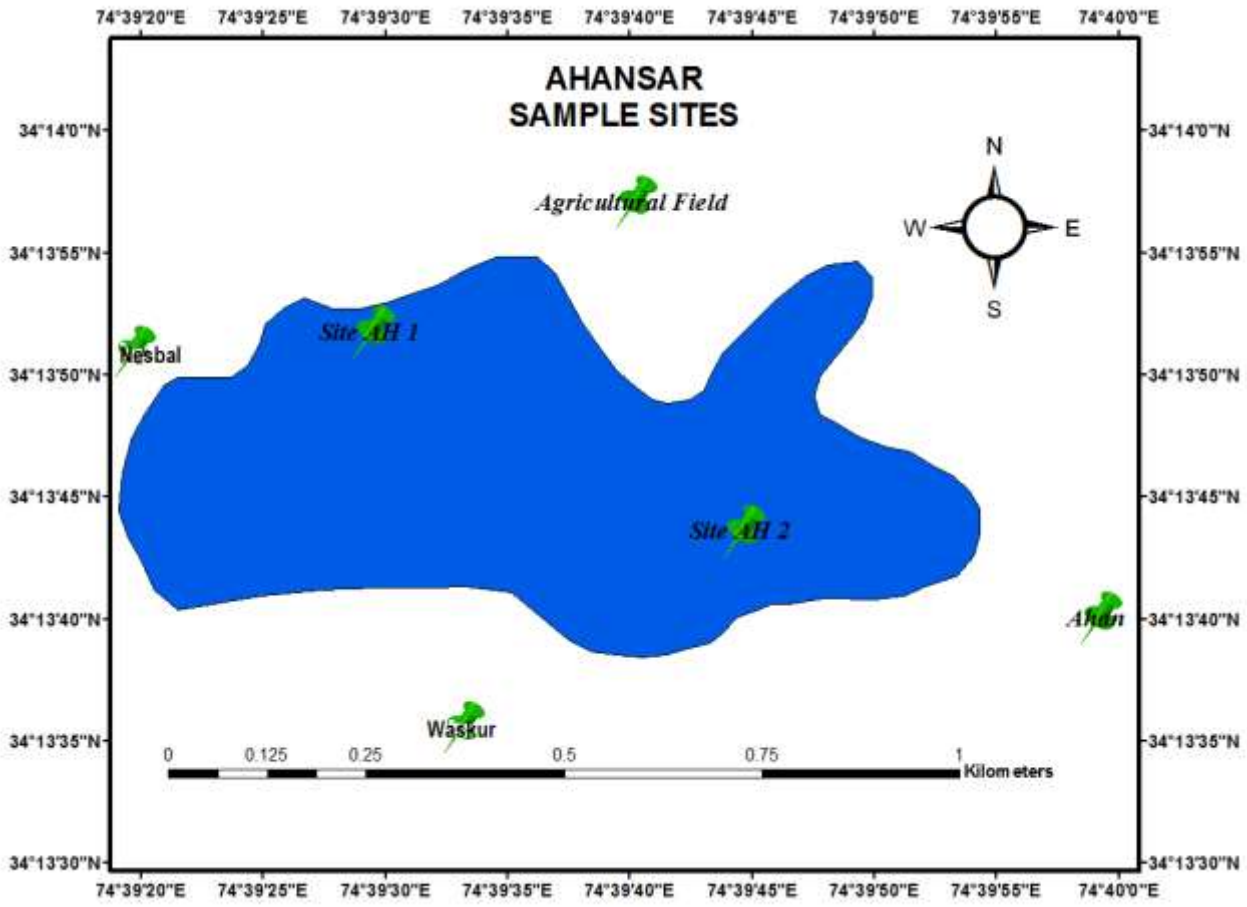
Enrichment of water by increased supply of nutrients on account of pollutant generating activities stress the lake ecosystem and cause significant impairement of lake water quality.Addition of artificial or natural nutrients mainly phosphates and nitrates through detergents , fertilizers and sewage to an aquatic system leads to deterioration of water quality .

Assessment of water quality is one of the prime concern and it reflects the several major influences due to anthropogenic activities . Hence it is necessary to analyze important water parameters when ecological studies on aquatic ecosystems are carried out which can provide reliable assessment in the ecosystem.

2 .Study Area and Study sites

Ahansar Lake is a small rural fresh water body situated at an altitude of 1585m (a.s.l) within the geographical coordinates of North latitude 34º13′37″- 34º 3′56″and East longitude 74º39′20″-74º39′54″, about 30 km north

of Srinagar, at Sumbal (District Bandipora). The lake is semi drainage type with the maximum depth of 5m and is spread over an area of 0.8 km^2 . There is no perennial inflow channel and the water supply of the lake is maintained by underground springs spread over its basin. Besides, an ephemeral irrigation channel supplements the water during paddy cultivation period. Apermanent out flow channel on western side drains excessive water from the lake intoRiver Jhelum. Macrophytic vegetation with emergents form a continuous belt along the periphery of the lake. The lake has a subtle combination of floral and faunal species. The dominance of rooted –floating leaf type and emergent species covering major portions
of the total lake area are suggestive of its highly evolved and productive status (Rather
and Pandit; 2002).



Map :- Ahansar Lake

AH1

This site was located in the northern part at 34°13′51″ N and 74°39′29″ E. The area is shallow with dense growth of *Typha* spp. and *Phragmites spp*. This site receives run off from near by agricultural fields.

AH2

This site was in the eastern part at 34°13′43″ N and 74°39′44″E. This site is usually used for washing activities. Domestic sewage and other organic wastes are discharged directly into the lake from the nearby village.

3. Materials and Methods

Temperature of both air and water was measured with the help of Celsius thermometer. The depth was determined with a weighted graduated non-stretchable line, transparency was by a 20 cm diameter Secchi disc painted black on under surface and white and black on upper surface. The pH and conductivity were measured with the help of

portable pH meter (HANNA Model –PHEP) and conductivity meter (HANNA Model – DIST -3). Dissolved oxygen content was estimated by Iodometric method (APHA 1998). Free carbon dioxide and alkalinity were determined by Titremetric method (Mackereth *et al*., 1978).Concentration of chloride was determined by silver nitrate method (APHA, 1998). Total hardness and calcium were determined by EDTA titremetric method (APHA, 1998). Phosphate (stannous chloride method), nitrate (salicylate method) and ammonia (phenate method) were analyzed with the help of Systronics 106 Spectrophotometer in accordance with CSIR (1974) and (Mackereth *et al*., 1978). To study the relative effect of some environmental factors Pearson correlation between was calculated.

4 .Results (Table 1)

Temperature :-

During the first year it ranged from 7.1ºC (January) at site AH1, AH2 to 34.5ºC (July) at site AH2, while in the second year it ranged from 6ºC (January) at site AH2 to 32.5ºC (July) at site AH1, AH2.

Surface water temperature ranged from 4.3ºC (January) at site AH2 to 28.8ºC (July) at AH1, while in the second year it ranged from 5.2ºC (January) at AH2 to 30.9ºC (July) at site AH1, AH2 (Table 1).

Transparency :-

In the lake transparency during the first year showed variations between 0.8m (December, January, November) at site AH1, AH2 to 1.7m (June) at site AH1, while in the second year it ranged from 0.6m (February) at site AH1 to 1.7m (June) at same site .

Depth :-

It showed variations in the first year from 0.8 m (December, January, November) at site AH1, AH2 to 1.7m (June) at site AH1, while as in the second year it varied from 0.8 m (December, January, November) at site AH1, AH2 to 1.7m (June) at site AH1.

Conductivity:-

It fluctuated in the first year from 210µS/cm (August) at site AH2 to 443µS/cm (December) at same site, while in the second year it ranged from 290µS/cm (July) at site AH1 to 465µS/cm (February) at site AH2.

Hydrogen ion concentration :-

The data pertaining to pH of water fluctuated between 7.2 (December) at site AH2 to 9.2 (August) at site AH1 in the first year and from 7.7 (December) to 8.9 (August) at site AH1 in the second year.

.

Dissolved Oxygen:-

Oxygen concentration varied in the first year from 4.2 mg/l (July) at site AH2 to 9.9 mg/l (April) at site AH1 while in the second year it varied from 4.8 mg /l (August) at site AH2 to 9.8 mg/l (April) at same site

.

Carbon dioxide :-

The data on the free carbon dioxide showed that the concentration varied from 7 mg/l (August) at site AH2 to 40 mg/l (January) at site AH1 in the first year and from 3 mg/l (May) at site AH2 to 26 mg/l (January) at site AH2 during the second year.

Alkalinity :-

The data on the total alkalinity in the lake fluctuated in the first year from 88 mg/l (February) at site AH1 to 312 mg/l (June) at same site. In the second year the range of fluctuation was 136 mg/l (January) at site AH2 to 298 mg/l (June) at site AH1. Carbonates were absent throughout the entire study period and alkalinity was mainly due to bicarbonates of calcium and magnesium .

Hardness:-

The total hardness ranged from 220 mg/l (August) at site AH2 to 376 mg/l (January) at same site in the first year and from 119 mg/l (September) at site AH2 to 387 mg/l (February) at site AH1in the second year.

.

Calcium hardness ranged from 65mg/l (June) at site AH2 to 167 mg/l (March) in the first year while during the second year it fluctuated from 86 mg/l (September)

at site AH2 to 153 mg/l (June) at site AH1 .

Chloride:-

Chloride content in the lake fluctuated from 12 mg/l (December/January/February) at site AH1 and AH2 to 19mg/l (April, August) at site AH2 in the first year and from 9 mg/l (April) at site AH1 to 26 mg/l (May) at site AH2.

Ammonical nitrogen:-

Ammonical nitrogen ranged from 120 µg/l (July, August) at site AH1 to 260µg/l at same site in the first year and from 134 µg/l (May) at site AH1 to 185 µg/l (March, November) at site AH1 and AH2 in the second year .

Nitrate nitrogen :-

In Ahansar lake nitrate nitrogen ranged from 235 µg/l (July) at AH1 to 402µg/l (March, November) at same site in the first year, while in the second year it fluctuated from 245µg/l (July) at site AH1 to 389 µg/l (April) at same site .

Total phosphate phosphorus :-

Data pertaining to total phosphate phosphorus ranged in the first year from 122 µg/l (September) at site AH2 to 312 µg/l (June) at site AH1 while in the second year it ranged from 124 µg/l (March) at site AH1 to 397 µg/l (July) at site AH2.

5 .Discussion :-

A close relationship between water and air temperature in the lake was recorded, with maximum values in summer and minimum in winter, which is in line with the findings of other workers (Stefan and Hendzo, 1993; Jamila and Yousuf , 2018).A positive correlation between air and water temperature was noted in the lake (r = 0.929**).

Depth of a lake is related to precipitation, melting of snow (Yousuf *et al*. 2006). The depth in the lake was low in winter / autumn and high in spring / summer. The depth had a direct effect on transparency and a positive correlation was recorded between the two. Maximum depth in Ahansar Lake during mid spring / summer seems to be due to continuous inflow of water from agricultural land. In Ahansar Lake water was clear and 100% transparency was recorded during the entire study period.

Natural water has low conductivity but contamination increases the level. Olsen (1950) has classified water bodies having conductivity values >300µS/cm as eutrophic, when this classification is applied to the present data Ahansar lake fall under the eutrophic category.

Dissolved oxygen concentration was higher in spring, while the lowest values were observed in summer.This is in line with the findings of (Jamila and Yousuf ,2018) . During the present study a negative correlation was recorded between water temperature and dissolved oxygen, (- 0.529**). During spring the plant community in the water body starts blooming, leading to release of large quantities of dissolved oxygen in to the water column, there by enhancing the oxygen content in the water column. In the Ahansar higher oxygen concentration at macrophyte site is relatable to the release of oxygen by the macrophytes during photosynthesis (Zutshi and Vass, 1970).

Hydrogen ion concentration showed an increase with increasing water temperature, indicating a positive correlation with the latter. A significant positive correlation was recorded between water temperature and pH (r = 0.774**) . Our findings are in line with Jamila and Yousuf (2018). High pH values in summer result from rapid removal and assimilation of dissolved carbon dioxide from the water. According to Venkateshwarlu (1983) water body can be categorized acidobiontic (with pH less than 5.3), acidophilous (pH 5.5 – 6.5), indifferent (pH 6.5 –7.5), alkaliphilous (pH 7.5 – 9.0). When this classification is applied to the present water body, it can be categorized as alkaliphilous .

Chandler (1970) stated that increase in carbon dioxide concentration in water results in a decrease in pH due to formation of carbonic acid. A negative correlation was recorded between carbon dioxide and pH (r= -0. 557**) . The concentration of carbon dioxide was high in winter and low in summer in the lake. This is due to high photosynthetic activity of macrophytes which consumes carbon dioxide during summer. During winter no photosynthesis occurs, with the result that carbon dioxide liberated as a by-product in the respiration of animals and plants gets accumulated in water in large quantities (Yousuf *et al*.,1986a) .The higher

concentration of carbon dioxide in Ahansar Lake seems to be related to the continuous oxidation of large quantities of organic matter existing there in, inhibiting the conversion of bicarbonates to carbonates.

The total alkalinity values have been used to differentiate soft and hard water bodies. According to Moyle (1949) lakes having total alkalinity values up to 40mg /l are considered "Soft", those with 40-90/l as "Medium hard" and those with values over 90 mg/ l as "Hard type". When this classification is applied tothe present lake, it becomes clear that the water body is typical "hardwater". The total alkalinity values were high indicating the productive nature of lake (Alikunhi, 1957).

Kundanger and Zutshi (1985, 1987) reported lime rich catchment in Ahansar Lake which brought high calcium load along with storm waters. Ohle (1934) has classified water bodies into 3 categories on the basis of calcium level, viz., poor (less than 10 mg /l), medium (from 10 –25mg/l) and rich (more than 25 mg/l). According to this classification the lake is "calcium rich water".

Chloride, in increased concentration is regarded as an indicator of eutrophication (Hynes, 1963),pollution due to sewage (Chourasia and Adoni, 1985) .Although the concentration of chloride in the lake was raised throughout the present study, which clearly indicates the higher level of pollution due to the entry of organic wastes of animal nature entering the water body.

Concentration of ammonical nitrogen in the lake was low in summer which may be due to its immediate utilization by plankton and other plants without consumption of any extra energy for chemical reduction through adsorption (Prochazkova, 1975). The higher concentration in winter may be due to accumulation of degradation products. According to Marshal and Falconer (1973) nitrates and ammonia show a close relationship with each other. During the present investigation a positive correlation was observed between nitrate and ammonia in the Ahansar lake (r =, 0. 374**). The lower concentration of nitrates in summer may be due to its uptake by autotrophs during their growth (Catalon *et al*., 1994).

Pandit and Yousuf (2002) classified Kashmir Himalayan lakes on the basis of phosphorus range for total phosphorus, oligotrophic < 10 µg, mesotrophic 10 – 30µg, eutrophy 30 -100 µg, hypertrophy > 100µg. As per this classification Ahansar lake falls under hyper eutrophic category.

6.References :-

Ali Kunhi, K.H. (1957). Fish Culture in Indian Bulletin of Indian Council of Agricultural Research, No 20, pp. 1 – 150.

APHA (1998). Standard methods for the examination of water and wastewater. 20th, ed. APHA Washington; D.C.

Catalan, J., Ballesteros, E., Gacia, E., Palau, A & Camarero, L. (1994). Chemical composition of disturbed and undisturbed high mountain lakes in the Pyrenees: *A Reference for Acidified Sites. Wat. Res.,* **27**: 133-141.

Chandler, J.R. (1970). A biological approach to water quality. *Management Water Pollution Control, **69**: 415 – 422.*

Chourasia, S.K. and Adoni A.D. (1985). Zooplankton dynamics in a shallow eutrophic lake. in. Proc. Nat. Samp. Pure and Appl. Limnology (Ed. A.B. Adoni). Bull. Bot. Soc. Sagar, India, **32**: 30 – 39.

C.S.I.R. (1974). Analytical Guide. *C.S.I.R. Pretoria*. South Africa.

Hynes, H.B.N. (1963). The biology of the polluted waters. Liver pool University press, U.K.PP 202

Jamila , I and Yousuf , A.R (2018). Seasonal Variations in Physico Chemical Characteristics of Dal Lake , Kashmir.Indian Journal of Ecology . 45(1):

Kundanger, M.R. and Zutsh, D.P. (1987). Ecology and production of some important Macrophyte species in two rural lakes of Kashmir. *J. Hydrobiol.,* **3**: 57 -62.

Mackereth, F.J.H., Heron, J. and Talling, J. F. (1978). Water analysis. *Fresh Water Biol. Assoc. Sci. Pub.* No. 36.

Olsen, S. (1950). Aquatic plants and hydrospheric factors I. Aquatic plants in S.W. Jutel and Denmark. Botanisk Tridskriff, **44**: 1 -34.

Pandit, A. K and Yousuf, A.R. 2002. Trophic status of Kashmir Himalayan lakes as depicted by water chemistry. *J. Res. Dev.*, **2**: 1 –12.

Prochazkova, L. (1975). In: Coupling of land and water systems (Ed. A, Hasla) *Ecol. Studies*, **10**: 65 – 73.

Stefan, H.G. and Hendzo, M. (1993). Regional water temperature characteristics of lakes subjected to climate change. *Climate Change*, **24**: 187 – 211.

Venkateswarlu, V. (1983). Taxonomy and ecology of algae in the River Moosi, Hyderabad, India. II-Bacillariophyceae. Bibliothecae Phycologica, **66**: 1-141.

Yousuf, A.R., Balkhi, M.H. and Qadri, M.Y. (1986). Limnological features of a forest lake of Kashmir. *J. Zool. Soc. India*, **38**(1/2): 29 – 42.

Yousuf, A.R., Bhat, F.A. and Mahdi, M.D. (2006). Limnological features of River Jhelum and its important tributaries in Kashmir Himalaya with a note on fish fauna of Himalayan Ecology and sustainable Development, **1**: 37 – 50.

Zutshi, D.P. and Vass, K.K. (1970). High altitude lakes of Kashmir, *Ichthyologia*, **10**: 12 – 15.

7 . Conclusion:-

The analysis of physico chemical characteristics of Ahansar Lake revealed that Lake water quality has deteriorated since it showed higher concentration of Nitrate nitrogen and Phosphate phosphorus reflecting nutrient enrichment condition of the Lake .

Table 1: Different Physico-chemical Parameters of Ahansar lake (Dec. 2011 - Nov. 2013)

Parameters	Year 2011 -2012	Year 2012 -2013
Air tem	7.1 - 34.5ºC	6 - 32.5ºC
Water tem	4.3 - 28.8ºC	5.2 - 30.9ºC
Transparency	0.8 - 1.7m	0.6 - 1.7m
Depth	0.8 - 1.7m	0.8 - 1.7m
Conductivity	210 - 443µS/cm	290 - 465µS/cm
pH	7.2- 9.2	7.7- 8.9
Dissolved oxygen	4.2 - 9.9 mg/l	4.8 - 9.8 mg/l
Carbon dioxide	7 - 40 mg/l	3 - 26 mg/l
Alkalinity	88 - 312 mg/l	136 - 298 mg/l
Hardness	220 - 376 mg/l	119 -387 mg/l
Calcium	65 - 167 mg/l	86 -153 mg/l
Chloride	12 - 19mg/l	9 - 26mg/l

Ammonical nitrogen	120 - 260µg/l	134 -185 µg/l
Total phosphate phosphorus	122 - 312 µg/l	124 - 397 µg/l

Table 2: Correlation coefficient between different Physico-chemical Parameters of Ahansar lake (Dec. 2011 - Nov. 2013)

Parameter	Water tem	Transparency	Carbon dioxide	Nitrate nitrogen
Air tem	0.929**			
Depth	0.664**	0.948**		
pH	0.774**	0.535**	-.557**	
Oxygen	-.529	0.511**	-.705**	
Ammonical nitrogen	-.606**	-.386**	0.580**	0.374**

** = Correlation is highly significant at $p < 0.01$ level.

.