



ORIGINAL ARTICLE

Studies on Measurement of Calcium, Magnesium and Fluoride in the Water of Dal Lake and Nageen Lake, Kashmir, India

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ABSTRACT

Dal Lake and Nageen Lake are very important sources of water in Kashmir. Use of non-biodegradable products like plastic, thermocol, packaging material is regularly encountering our environment as well as aquatic bodies. These materials affect aquatic fauna and flora. Further, use of this water will harm human health in many ways. We are getting necessary minerals from drinking water but abnormality in mineral level in water is affecting human health directly. Measurement of calcium, magnesium and fluoride which are indicators of water quality are taken into consideration while conducting this study in Dal Lake and Nageen Lake in Kashmir.

Key words: Calcium, Magnesium, Fluoride, Dal Lake and Nageen Lake

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INTRODUCTION

In recent years, the Dal Lake of the Himalayan Kashmir valley has suffered with formation of a rare phenomenon of red bloom of new species discovered as *Euglena shafiqii*. The area within and around the Lake has been encroached for human settlements, agriculture activities and for tourism industry. At present, there exist more than 2000 house boats on the waters at the bank of the Dal Lake. The maximum damage to the Lake at the western side has been caused by continuous installation of new floating gardens for vegetable production. Almost all the old floating gardens have been turned into permanent agriculture activity and/or subsequent settlements. Besides, deforestation of surrounding hills and agricultural activity in catchments of the Dal Lake have allowed huge erosion of the soil and subsequent deposition into the Lake basin. It has been however, estimated that about 36.10^6 m³ of silt is annually poured into Dal Lake. The enrichment of waters by sewage or plant nutrients (a process called eutrophication) causes major problems in Lake, such as blocking of vital water ways, making water hard to treat for drinking supplies, decreasing oxygen levels making fish stocks harder to support, reducing diversity of fauna, and lowering the amenity value of water. Being an urban type Lake, municipal and domestic effluents have altered the surface water composition of Dal Lake, leading to increased eutrophication. The results indicate that the direct discharge of sewage from houseboats, interruptions to the flow of water, human encroachments, increase in population within the catchment area, etc, have resulted in the deterioration of water quality, prolific growth of aquatic macrophytes and siltation. Keeping in view, the ecological significance of water bodies in Kashmir like Dal Lake, the present investigation

were undertaken to determine the variations in physicochemical characteristics of Dal Lake and Nageen Lake.

MATERIALS AND METHODS

For the present study, five sampling sites are chosen in Dal Lake and five are from Nageen Lake to assess the water quality of these two Lakes in two different seasons (August and December).

Site 1 is located at latitude $34^{\circ} 08' 45.99''N$ and longitude $74^{\circ} 50' 48.23''E$ near Duck Park. Site 2 is located at latitude $34^{\circ} 08' 45.78''N$ and longitude $74^{\circ} 50' 34.34''E$ near Sewage treatment plant Habak. Site 3 is located near Primary health centre, Habak at latitude $34^{\circ} 08' 21.53''N$ and longitude $74^{\circ} 50' 23.08''E$ the average depth of the site is 1.4 m. Site 4 is located at latitude $34^{\circ} 08' 6.26''N$ and longitude $74^{\circ} 50' 27.44''E$ near Naseem Bagh. Site 5 is located at latitude $34^{\circ} 07' 43.85''N$ and longitude $74^{\circ} 50' 31.51''E$ near Hazratbal Dargh. For the present study five sampling sites of Nageen Lake were selected on the basis of water depth, vegetation, biotic variables and anthropogenic stresses (Figs 1 & 2). The first site with depth of 1.5-2.5 m was located in south west area of Lake near residential area known as Khuj Yarbal. The second site with 4.0 m deep being located in central area of the Lake was clear with patchy growth of macrophytic vegetation. The third site was located near Golf club associated with house boats and its depth ranged from 2.0-2.6 m. The water of this site was slightly turbid compared to first site with sparse growth of macrophytic vegetation. The fourth site was located in the north east side of Hazratbal basin near Ashaibagh bridge acting as inlet source of Nageen basin and receiving water from other basins of Dal Lake. The depth at this site ranged from 2.3-2.7 m. Site five was selected opposite from Ghat 1.

Analysis of Calcium:

Calcium was obtained by Titrimetric method. Required chemicals are:- Buffer solution 1ml($NH_4Cl+NH_4OH+EDTA$), Eeichrome Black T a pinch(Erichrome Black T+NaCl), and titrate with EDTA solution till the Brick Red color change to Blue.

Analysis of Magnesium:

Calcium was obtained by Titrimetric method. Required chemicals are:- Buffer solution 1ml($NH_4Cl+NH_4OH+EDTA$), Eeichrome Black T a pinch(Erichrome Black T+NaCl), and titrate with EDTA solution till the Brick Red color change to Blue.

Analysis of Fluoride:

Fluoride was determined by electrochemically, using the Ion Selective Electrode method. This method is applicable to the measurement of fluoride in drinking water in the concentration range of 0.1–1,000 mg/l. Standards fluoride solutions (0.1–10 mg/l) were prepared from a stock solution (100 mg/l) of sodium fluoride. TISABIII (1 ml) of every 10 ml sample was added to adjust the pH of the solution before estimation.

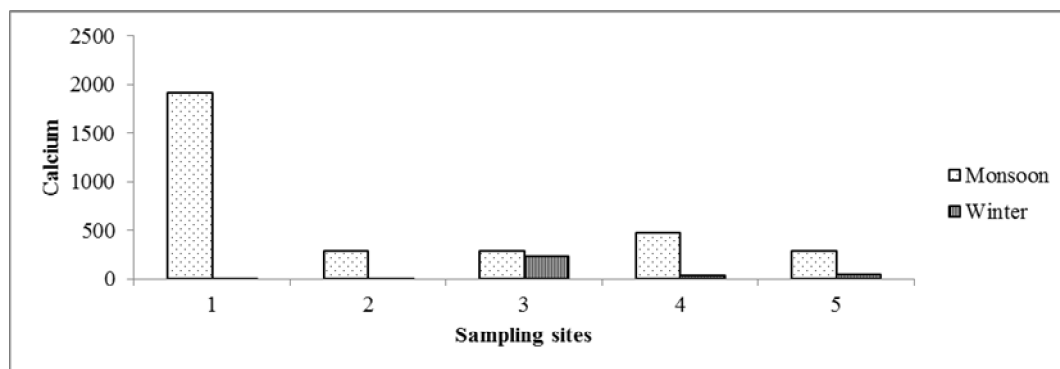


Fig. 1: Showing variation in calcium levels at different sites of Dal Lake

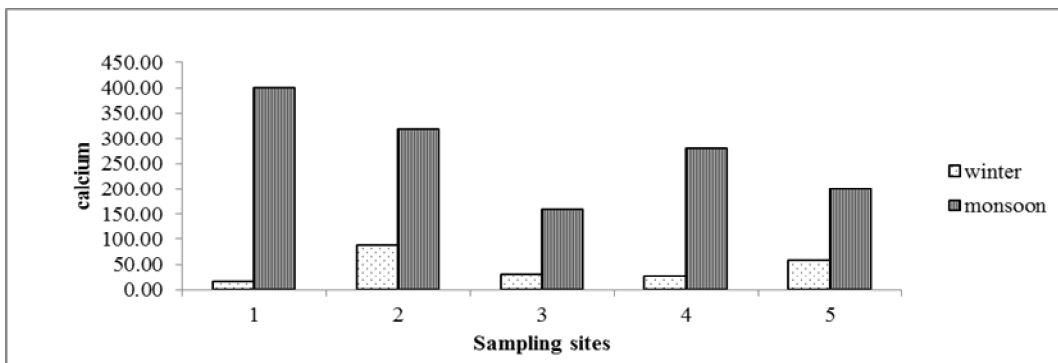


Fig. 2: Showing variation in calcium levels at different sites of Nageen Lake

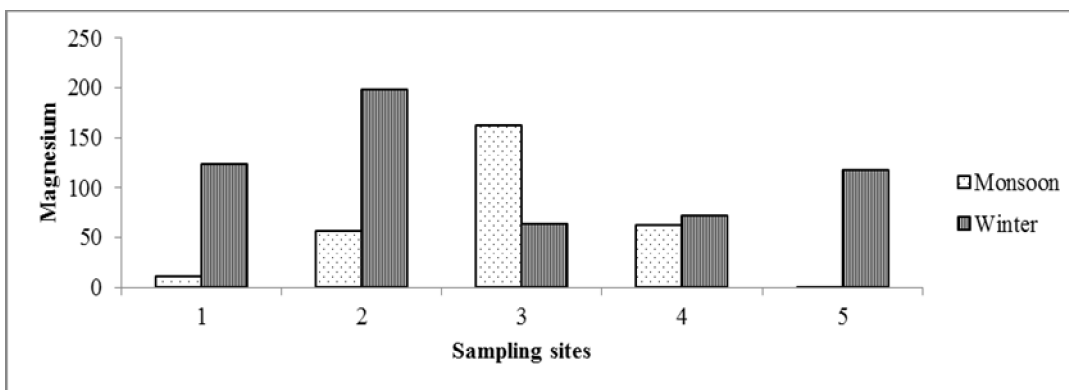


Fig. 3: Showing variation in magnesium levels at different sites of Dal Lake

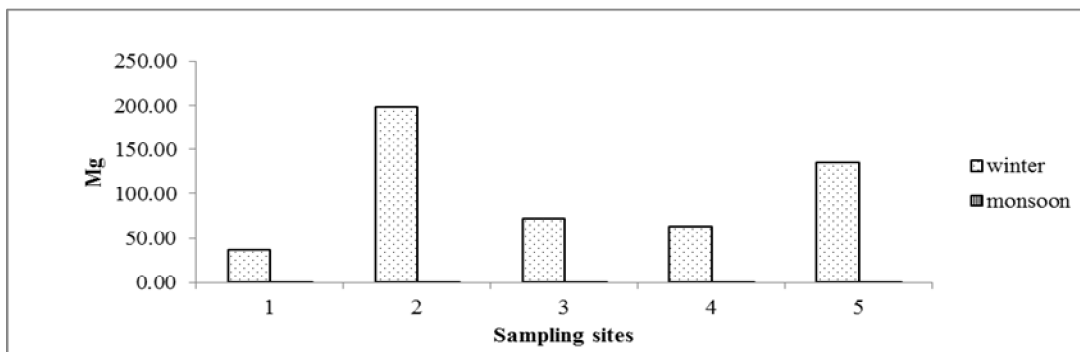


Fig. 4: Showing variation in magnesium levels at different sites of Nageen Lake

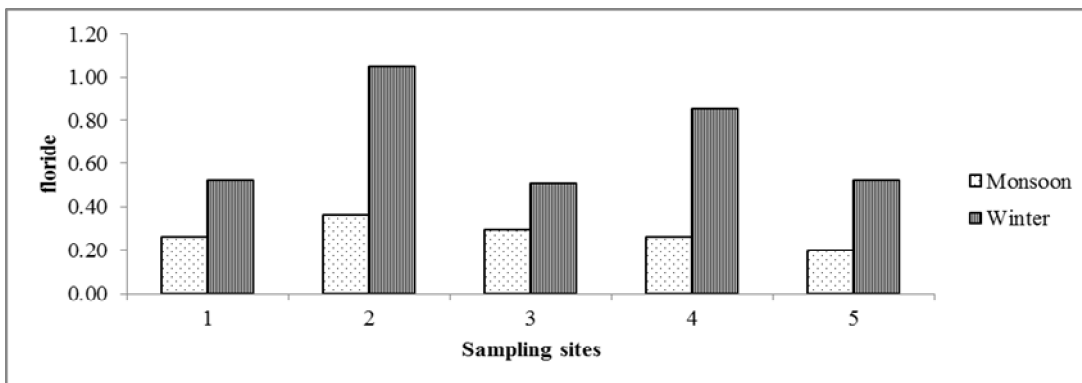


Fig. 5: Showing variation in fluoride levels at different sites of Dal Lake

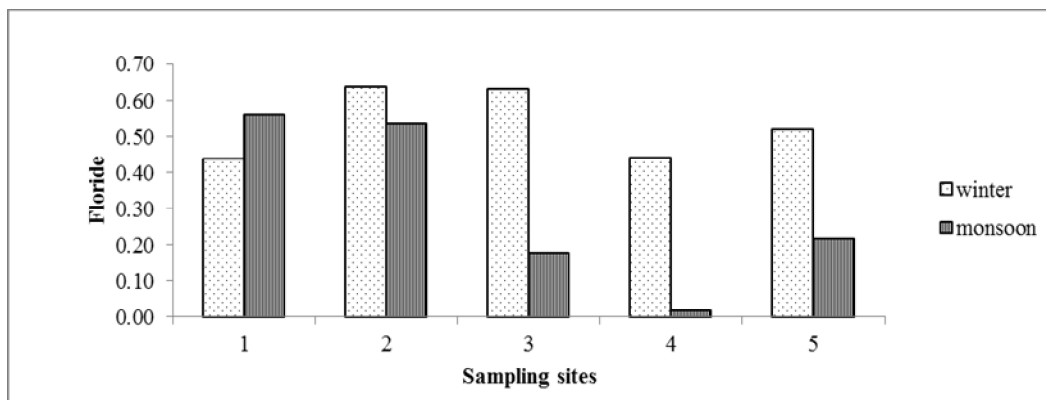


Fig. 6: Showing variation in fluoride levels at different sites of Nageen Lake

RESULTS AND DISCUSSION

The main sources of calcium in natural water are various types of rocks, industrial waste and sewage. There is evidence that hard water plays a role in heart diseases. Its value was found in the range of 8.02-1923.84 in Dal Lake and 16.03-400.8 in Nageen Lake mg/l which is slightly higher than the permissible limit as prescribed by WHO but well within the permissible limits as prescribed by BIS standards.

Magnesium is often associated with calcium in all kinds of water, but its concentration remains generally lower than the calcium. Magnesium is essential for chlorophyll growth and acts as a limiting factor for the growth of phytoplankton. Therefore, depletion of magnesium reduces the number of phytoplankton's population. In the present investigation, the magnesium, in Dal Lake ranges between 1.54 -114 mg/L and in Nageen Lake, it ranges between 0.88 -198 mg/L.

The sources of fluorides are mainly, industries of iron, steel production, petroleum refining and phosphate fertilizer. Higher concentration of fluoride causes bone and dental fluorosis. The BIS permissible limit for fluoride in groundwater is 1mg/l. However, in temperate region this limit is 1.5 mg/l, where, water intake is low. Fluoride (F) varied from permissible limit for F concentration is 11.5 mg/l according to WHO (2003). Fluoride concentration less than 0.8 mg/l leads to dental caries. Hence it is essential to maintain fluoride concentration between 0.8 to 1.0 mg/l in drinking water. In Dal Lake fluoride concentration varies between 0.20 to 1.05. Maximum Concentration 1.05 was recorded at site near sewage treatment plant Habak. In Nageen Lake Fluoride concentration ranges 0.09 to 0.64, maximum in winter season. So, it is concluded that concentration ranges with in permissible limit.

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