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RESEARCH ARTICLE

SEASONAL VARIATIONS IN PHYSICO-CHEMICAL PARAMETRES OF SHALABUGH WETLAND, KASHMIR

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ABSTRACT

The present investigation was carried out to monitor the Physico-chemical characteristics of Shalabugh wetland. Physico-chemical parameters like water temperature, Transparency, pH, Dissolved oxygen, Free carbon dioxide, Total alkalinity, Conductivity, total Hardness, Chloride, Ammonical nitrogen, Nitrate nitrogen, Nitrite nitrogen, Total phosphorus were analyzed on monthly basis for a period of one year from January 2013 to December 2013 .Among various parameters recorded the water temperature ranged from 4.6 ^{0}c to 29 ^{0}c ,transparency from 0.22 m to 0.82 m, pH from 7.25 to 8.57, dissolved oxygen 4.0 mg/l to10.3mg/l, free carbon dioxide from 3.1mg/l to15.7mg/l, total alkalinity 119.5mg/l to 272.7 mg/l, conductivity from 300.7µs/cm to 412.5 µs/cm, total hardness from 241.7 mg/l to346mg/l, chloride from 23.5mg/l to44.7 mg/l, Ammonical nitrogen from 117µg/l to363.5µg/l, Nitrate nitrogen from 165µg/l to 500µg/l, total phosphorus from 147µg/l to341.7µg/l. The high values of physico-chemical parameters obtained during the present study indicate the eutrophic nature of the wetland.

INTRODUCTION

Wetlands are one of the most important ecosystems and are often referred to as "biological supermarkets" for the extensive food chain and rich biodiversity they support (Mitsch and Gosselink, 1993). Wetlands also help in flood protection; improve water quality by buffering sediments, nutrients and contaminants coming from inflowing waters; support local and migratory animals and provide a wide variety of foods (Groom *et al*, 2006). However, wetlands are among the most threatened habitats mainly due to drainage, land reclamation, pollution, and overexploitation of wetland species. Also, the accumulation of nitrogen, phosphorus, and pesticides from agricultural runoff leads to severe degradation of wetlands (Ramsar convention Bureau, 2002). Monitoring water quality parameters is very important to determine the actual limnological status of wetlands, an effort which is vital for developing and implementing management strategies for their conservation. Water quality is the primary factor in the health of aquatic habitats, including habitats for fish, plankton, and other organisms (Bratram and Ballence, 1996). The physico-chemical characteristics of water have direct influence on the distribution of aquatic biota and vice-versa (De, 2000). The Shalabugh wetland, situated to the north of Srinagar city is an important wetland of Kashmir Himalayas in view of its being a rich repository of both resident and migratory avian fauna.

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The wetland is fed by several branches of Sindh stream on its north western side and some tributaries of Anchar on its eastern side .For the last few decades, the water quality of the wetland has deteriorated due to anthropogenic activities. Therefore ,in order to assess the ecological status of the wetland it becomes imperative to assess the water quality of the Shalabugh wetland.

MATERIALS AND METHODS

Study Area

Shalbugh wetland is situated in district Ganderbal, 18 km from Srinagar city at an altitude of 1584 m (ASL). It lies in the deltic region of the Sindh nallah to the North- west of the Anchar lake within the geographical coordinates of 74^0 40' - 74^0 46' E longitude and 34^0 08'– 34^0 1' N latitude. The total surface area of the wetland is about 790.25 hacters and have the approximate mean depth of 2.5m . For the present study four sites were selected in the wetland .Site 1 was selected near the inlet from the Anchar lake, site 2 from the open water area of the wetland having rich population of submerged macrophytes. Site 3 was choosen in emergent vegetation zone and site 4 was selected near the outlet connected with the Sindh stream.

MATERIALS AND METHODS

Water samples were collected from all the four sampling stations of the wetland every month in the morning hours

from January 2013 to December 2013. The temperatures were recorded at the time of sampling on the spot using centigrade thermometer. The transparency of water to light was measured by Secchi disc. For dissolved oxygen the sample was fixed at the spot in accordance with winkler's method. The pH was determined by using standard pH meter. Conductivity was measured by digital conductivity meter. The other parameters of water such as free carbon dioxide, alkalinity, total hardness, chloride, Ammonical nitrogen, nitrate nitrogen, and total phosphorus were estimated by the procedures given by APHA, 1998.

RESULTS AND DISCUSSION

Range of variation and their mean along with standard deviation of various Physico-chemical characteristics of water of Shalabugh wetland, Kashmir have been given in (Table 1).

Table 1. Range of variation, mean and standard deviation of water quality parameters of Shalbugh Wetland from January 2013 to December 2013

S.No	Parameter	Minimum	Maximum	Mean±SD
1	Water Temperature(0c)	4.6	29.0	17.48 ± 8.28
2	Transparency(m)	0.22	0.82	0.55 ± 0.19
3	pH	7.25	8.57	7.82± 0.41
4	Dissolved oxygen(mg/l)	4.0	10.3	6.95 ± 2.22
5	Free co2(mg/l)	3.1	15.7	8.91 ± 4.48
6	Total alkalinity(mg/l)	119.5	272.7	191.0 ± 47.75
7	Conductivity(µs/cm)	300.7	412.5	355.33± 39.35
8	Total hardness(mg/l)	241.7	346	284.37 ±31.86
9	Chloride(mg/l)	23.5	44.7	32.97±7.69
10	Ammonical-Nitrogen(µg/l)	117	363.5	239.39 ± 92.74
11	Nitrate –Nitrogen(µg/l)	165.2	499.7	314.85 ±110.73
12	Total Phosphorus(µg/l)	147	341.7	233.08 ± 31.86

During the present study the average monthly water temperature fluctuated from 4.6 0c in the month of January to 29.0 0c in the month of July with an annual mean of 17.48±8.28 0c showing a distinct seasonal trend of maximum values in summer and minimum in winter. The rise in temperature could be due to the fact that in winter photoperiod was shorter and less intense than summer (Salam *et al.,* 2000). Water Transparency is an important factor that controls relationship at different trophic levels. It is essentially a function of reflection of light from surface and is influenced by the absorption characteristics of both of water and of its dissolved and particulate matter (Stepane, 1959). In the present study transparency was found to vary from 0.22m in June to 0.82m in the month of February with an average of 0.55±0.19m. Higher transparency values during the winter season may be due to sedimentation of suspended soil particles (Singh, 1990) and low suspended organic matter with poor planktonic growth (Sinha *et al.,* 2002). pH is considered as one of the most important chemical parameter of water since most of the aquatic organisms are adopted to an average pH. The pH values in the present study ranged from 7.25 to 8.57 with an average of 7.82±0.14 which indicates the alkaline nature of water. Higher values of pH was observed in summer season while as lower in winter season .High values of pH during the summer months may be attributed to high rate of photosynthesis of micro and macro vegetation resulting in high production of free co_2, shifting the equilibrium towards alkaline side (Trivedi, 1989). In any aquatic ecosystem, dissolved oxygen is of paramount importance because it is critical to the survival of most forms of aquatic life besides being the most reliable criterion in assessing the trophic status and the magnitude of eutrophication (Edmondson, 1966). In the present study, the average concentration of oxygen, varied from 4.0 mg/l to 10.3 mg/l. The dissolved oxygen concentration was found to be higher in winter (December) and lower in summer (July) season. Value of DO increased in winter due to circulation of cold water as well as high solubility of oxygen at low temperature (Suthara *et al*., 2005). Free carbon dioxide liberated during respiration and decay of organic matter is highly Soluble in natural waters. The carbon dioxide content of water depends upon the water temperature, depth, rate of respiration, decomposition of organic matter, chemical nature of the bottom and geographical features of the terrain surrounding the water body (Sakhare and Joshi, 2002). In the present study free co_2 ranged from 4.0 mg/l (summer) to 10.3mg/l (winter) with a mean value of 8.91±4.48mg/l. The minimum values recorded during the summer months may be attributed to luxuriant growth of macrophytes (Shah and Pandit, 2012). The alkalinity of water is mainly due to bicarbonates. The values of total alkalinity ranged from 119.5 mg/l to 272.7 mg/l with an average of 191.0±47.75 mg/L, of which maximum value (272.7 mg/L)was observed in winter season and minimum value (119.5 mg/L) in summer season. The lower values during summer may be attributed to utilization of carbon dioxide by autrotrophs and therefore precipitation of calcium as calcium carbonate (Otsuki and Wetzel 1972). Electrical Conductivity is another key factor that determines the quality of water. It is a measure of purity of water. The EC value in the present study ranged between 300.7µs/cm to 412.5 µs/cm being maximum (412.5µs/cms/cm) in September and minimum (300.7µs/cm) in May. The fluctuations in EC are due to fluctuation in total dissolved solids and salinity (Pandey and Pandey 2003). Total hardness is the parameter of water quality used to describe the effect of dissolved minerals (mostly Ca and Mg), determining suitability of water for domestic ,industrial and drinking purpose attributed to presence of bicarbonates, sulphates, chloride and nitrates of calcium and magnesium (Taylor, 1949). The variation in Total hardness during the study period was recorded as 241.7 mg/l to 346.0 mg/l with an average value of 284.37±31.86 mg/l. The maximum values of Total hardness was found during the summer season ,which may be due to evaporation of water, addition of calcium and

magnesium salts and sewage inflow (Chaurasia and Pandey, 2007). Chloride values in the present study were found ranging between 23.5 to 44.7 mg/L of which maximum value (44.7 mg/L) was noticed in summer season and the minimum value (23.5 mg/L) in winter season. The higher concentration of chloride is considered to be an indicator of higher pollution due to higher organic waste of animal origin. Jana (1973) and Govindan and Sundaresan (1979) observed that higher concentration of chloride in the summer period could be also due to sewage mixing, increased temperature and evaporation of water. During the study period the values of Ammonical-Nitrogen fluctuated from 117.o µg/l in the month of July to 363.5µg/l in the month of December with an average value of 239.39±92.74µg/l. Such fluctuations in the values of Ammonical nitrogen may be due to decomposition of organic matter and bird droppings into the lake as it is visited by many aquatic birds (Zuber, 2007).

During the investigation period the values of nitrate nitrogen recorded were in the range 165.2µg/L(June) to 499.7µg/L (December) with an average of 314.85±110.73 µg/L. Trisal (1977) opined that the increase in nitrate- nitrogen content during winter is the cumulative effect of nitrification in the water column and the mud water interface. Ganapati (1960) pointed out that the concentration of nitrate-nitrogen (>150µg/L) is an indicative of eutrophication and as such the Shalbugh wetland falls in eutrophic category. Phosphorous, is generally recognized as one of the key nutrients in the productivity of fresh waters as it is essential element in determining the fertility of lakes. In the present study the concentration of phosphorus varied from 147.0µg/l to 341.7 µg/l with an average of 233.08 ± 64.49 µg/l. The maximum values of Total Phosphorus were found during the autumn and winter period which may be apparently related to the decomposition process (Siraj *et al*., 2010). The findings clearly indicate that the wetland is in eutrophic state and needs urgent attention for ecorestoration and sustainable management.

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