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Study of Physico-Chemical Characteristics of Fresh Water Wetland Luna Ki Dhani (Water Logged Area of Tibbi) in Hanumangarh District, North Rajasthan, India

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Abstract

The Present work deals with the study of water quality of Fresh water Wetland (Water Logged Area) of Tibbi in Hanumangarh District with regards to physico chemical parameters like water temperature, pH, Turbidity, Dissolved oxygen (DO2), Total alkalinity (TA), Electrical conductivity (EC), Salinity and phosphate ($PO4^{3}$-). The physic chemical characteristic of Tibbi Wetland is found to be highly fluctuated with seasonal variations during the present investigation. High value of dissolved oxygen obtained during winter months and shows inverse relation with water temperature, pH, EC have had maximum concentrations in summer. The study revealed that the water quality is rich in salinity and Phosphate content which indicates that of Tibbi waterlogged area is higher saline and moderately eutrophicated. high salinity damage the crop area.

Keywords: Water Quality, Wetland (Water Logged Area), Physico-Chemical Parameters.

Introduction

Wetlands are very productive ecosystems that help in the regulation of hydrological cycles, maintenance of water quality, nutrient movement and support for food chains. Wetlands are the areas wherein water is the primary factor controlling the environment and the associated plant and animal life.The essence of a wetland being its relative shallowness, hydric soil and hydrophytic vegetation. Their important functions include biodiversity reserves for threatened and endangered species, nutrient recycling, purification of water and ground water recharge. (Pramod,et al 2011and Sarkar and Upadhyay, 2013). Water logging problem has been cause due to excessive irrigation seepage from canal and lack of drainage. Indiscriminate use of irrigation water, canal seepage, sandy texture, and absence of natural surface drainage are considered as the main reason for soil degradation (Shankarnarayan and Gupta 1991). These factor resulted in to the rise of water table, development of salinity and the finally submergence of the land .

Aim of the Study

The purpose of the present study is to observe water quality of Tibbi wetland by physico chemical parameter and to determine the changes in water quality parameters by seasons.

Review of Literature

Quality of an aquatic ecosystem is dependent on the physical and chemical qualities of water as also biological diversity of the system (Ghavzan et al., 2006; Tiwari and Chauhan, 2006; Tas and Gonulol, 2007). The physical and chemical characters of the wetlands water can be used to assess the ecological nature of the wetlands. Several studies have been conducted to understand the physical and chemical properties of lakes, wetlands and reservoirs RajaseKara et al., (2005). Barman D.*1, Roy B2 and Roy S3(2015) studied that the physico – chemical parameters of wetlands in West Garo Hill, Meghalaya were recorded in different seasons to assess the quality status of water. The parameters were water temperature, pH, electrical conductivity (EC), dissolved oxygen (DO), biological oxygen demand (BOD), chemical oxygen demand (COD), total

suspended solid (TSS), total dissolved solid (TDS), total hardness, nitrate(NO3) and phosphate (PO4). The wetlands of west Garo Hill were found to be highly fluctuates with season

Material and Methods

Study Area

Hanumangarh is a city in North Rajasthan, and Tibbi(Luna Ki Dhani) is situated in Hanumangarh District. About 210 villages have been affected by water logged problem. But Luna Ki Dhani covered 750 meter area of waterlogged problem in Hanumangarh District. These waterlogged area affected from Salinity/ Alkalinity problem.In this research work Climate is divided into three seasons, Summer (March –June), rainy (July – October) and winter (November – February).

The present study was conducted on the physico-chemical parameters of the Luna Ki Dhani (Tibbi) Wetland. The wetland is situated at a distance of about 2 km from the Masitawali Head and almost 40 km far from hanumangarh District . It is a freshwater wetland with an average depth of 0.5 to 0.8 m . Salinity is one of the most important problems of this wetland (Water logged).

Name Luna Ki Dhani (Water Logged Area of Tibbi) Wetland

Location 29.28* N Latitude 74.38*E Longitude Wetland Type Waterlogged (Natural) Wetland Area 750 meter Overall Tubidity Normal

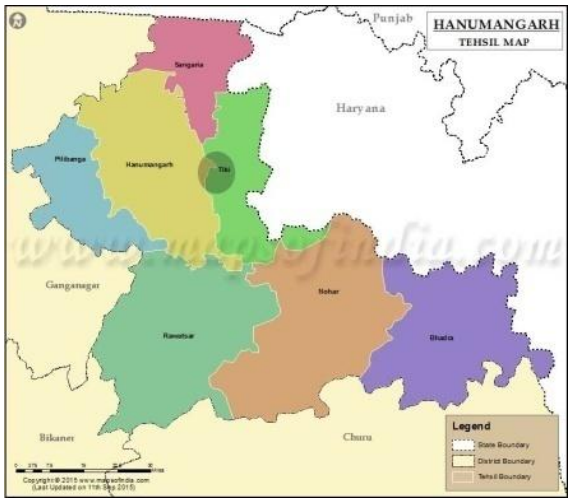

Figure no. 2 Location of Water logged area of Luna ki Dhani (Tiibi) District Hanumangarh (Raj.)

Sampling Methods

The water samples were collected from Luna Ki Dhani wetland at monthly intervals from April 2015 to March 2016 during 8.00 – 10.00 am in fresh unsullied plastic bottles. The closed bottle was dipped into the water and then the cap is opened and water is allowed to fill up the bottle absolutely. The cap is then closed and the bottle is bring out of the water. Several physico chemical parameters such as, water temperature, pH, turbidity, electrical conductivity, Salinity, dissolved oxygen (DO2), total alkalinity (TA), and phosphate **($PO4^{3}$-)** has been analyzed .In which water temperature, pH, DO were determined in the field itself.

Analysis of Water Quality Parameters

Water temperature is measured *in situ* by using hand mercury thermometer, pH was estimated by Digital pH –meter (Systronics Type-335). Turbidity was measured by Water Analyzer, Turbidity meter, Electrical conductivity was measured by conductivity meter.For the estimation of other parameters, water sample is brought to the laboratory. The analysis of various physico-chemical characteristics of water were done as per the standard methods given by APHA (1998) and Trivedi and Goel (1984)

Results and Discussion

Physico-chemical parameters (Water logged area) wetland obtained during the present investigation (during April 2015 – March 2016), is presented in table.

Seasonal Variation of Physio-Chemical Characters of Tibbi (Luna Ki Dhani) (Water Logged Area) in Hanumangarh District Rajasthan(April2015-March 2016)

Parameter	Season		
	Summer	Rainy	winter
Water temperature (C)	35 C	26.5C	18.5 C
pH	7.9	8.2	9.0
Turbidity NTU	52	47	40
EC ds /m	4.5	4.35	4.2
Salinity mg/l	27,000	26,100	25,200
Do mg/l	7.5	8.4	10.8
Total Alkalinity mg/l	160	290	380
Phosphate mg/l	6.5	8.5	5.9

Water Temperature

Temperature is a physical factor that alters the water characteristics and considered as an important factor in controlling the fluctuation of plantation and functioning of aquatic ecosystem .In the present investigation seasonal variability of atmospheric and water temperature have been observed. It was maximum (35*C) during summer and minimum (18.5*C) during winter. This investigation is also in close conformity with the finding of Singh and Mathur, (2005). Chaturbhuj et al., (2004,)

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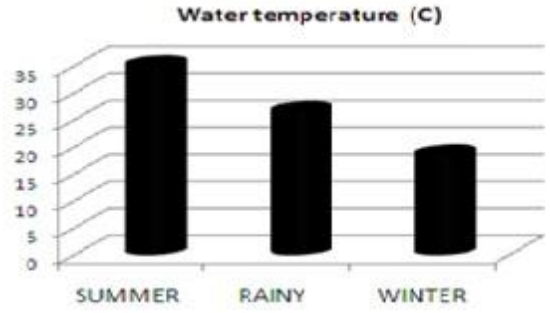
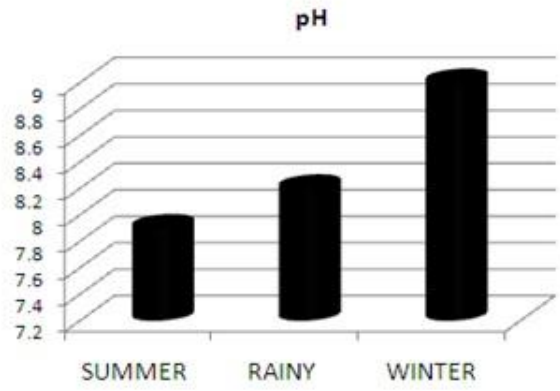
Figure no. 2
Seasonal Variation in Water Temperature of Luna Ki Dhani (Water Logged Area of Tibbi) During one year Study Period pH



pH determines the acidic and basic characters of water. It is a index of general environmental condition.The maximum pH value were in the month of June 9.0 and minimum in the month of December 7.9 and are related to photosynthetic activity of phytoplankton and macrophytes resulting in CO2 utilization .The similar finding given by Brose and Bhave, 2000, Satpathy*et al.,* 2007, Bhat, 2009 and Kumar *et al,.* 2009)

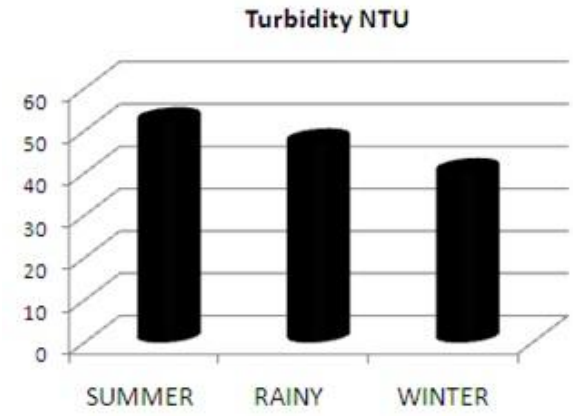
Figure no. 3
Seasonal Variation in pH of Luna Ki Dhani (Water Logged Area of Tibbi) During one year Study Period



Turbidity

Turbidity reduces the amount of light penetrating the water due to the presence of various suspended particles such as clay, silt, plankton, algae, etc. In the present investigation the turbidity of water was found maximum 52 NTU during the summer season and minimum turbidity 40 NTU was obtained during winter . Similar findings have been projected by offem *et al.* (2011) and Tamrakar and Raj (2013).

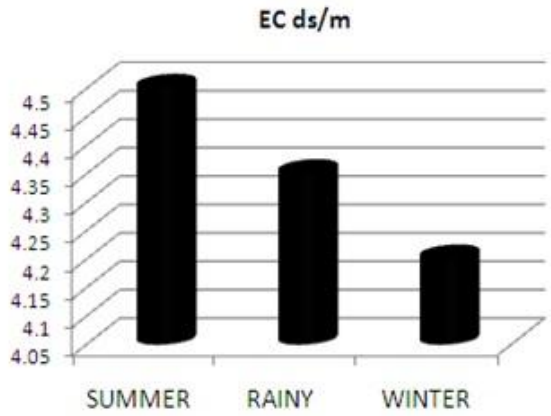
Figure no. 4
Seasonal Variation in Turbidity of Luna Ki Dhani (Water Logged area in Tibbi) During one year Study Period



Electrical Conductivity

Electrical conductivity of the water depends on the nature and concentration of salts. In the present study high values of conductivity, High conductance leads to salinity problem, eutrophication and finally leads to pollution of water body .The values of electrical conductivity maximum 4.5ds/m during summer and minimum 4.2 ds/m during winter season. Similar results were observed by various workers (Datta and Bhagwati, 2007; Hulyal and Kaliwal, 2011; Ramulu. and Benarjee, 2013).

Figure no. 5
Seasonal Variation in Electrical Conductivity of Luna Ki Dhani (Water Logged area of Tibbi) During one year Study Period

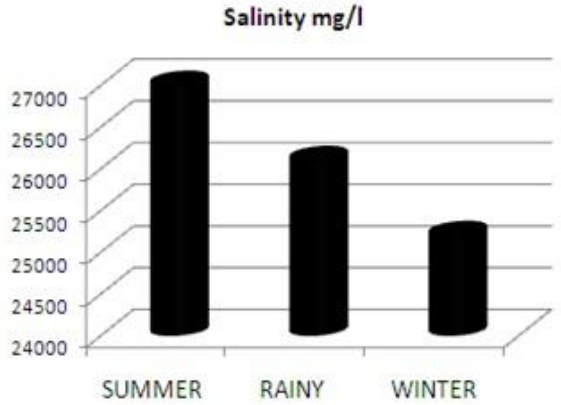


Salinity

Salinity is the saltiness or dissolved salt content of a body of water Salinity is an important factor in determining many aspects of the chemistry of natural waters and of biological processes within it.in the present investigation the maximum salinity 27000 mg/l observed in summer season and minimum salinity 25200 mg/l observed in winter season.(Verma et al., 2012).

Figure no. 6

Seasonal Variation in Salinity of Luna Ki Dhani (Water Logged Area of Tibbi) During one year Study Period

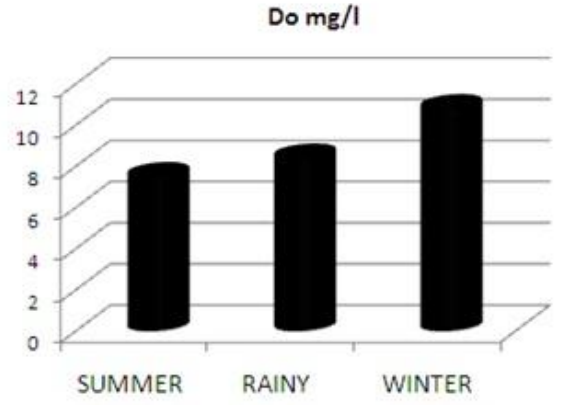


Dissolved Oxygen (DO)

Dissolved oxygen is regarded as one of the best indicator to assess the health of a water body. Minimum DO of water was recorded in the month of May (7.5 mg/L) and maximum in December (10.8 mg/L). Results of the present study are similar to those reported by other workers S.B Hulya. And B.B Kaliwal (2011), N.K. Ramulu et.,al. (2013) B.N Prasad (1985). The maximum dissolve oxygen in winter may be due to low atmospheric temperature and minimum dissolve oxygen in summer may be due to high metabolic rate of organisms.

Figure no. 7

Seasonal Variation in Dissolved Oxygen of Luna Ki Dhani (Water Logged Area of Tibbi) During one year Study Period

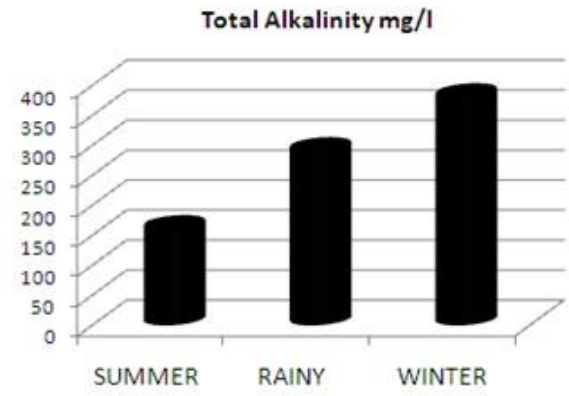


Total Alkalinity (TA)

Total alkalinity is imparted by presence of bicarbonate, carbonate and hydroxide and less frequently in wetland by borate, silicate and phosphate.Total alkalinity obtained in the range of 160 mg/L to 380 mg/l. in the present investigation. The highest value shows during the winter months and lowest in the summer months. Similar trend was reported by Dhembare (2011)

Figure no. 8

Seasonal Variation in Alkalinity of Luna Ki Dhani (Water Logged Area of Tibbi) During one year Study Period

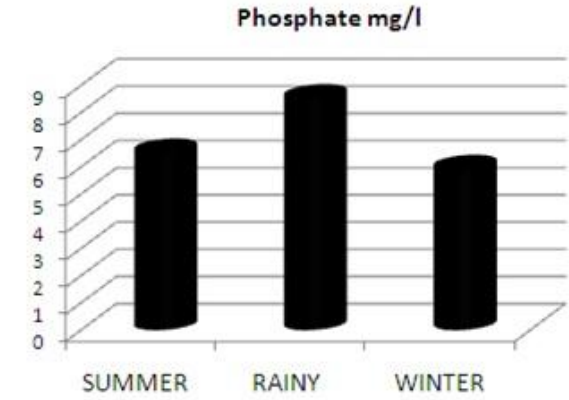


Phosphate (PO4---)

Phosphate is the key nutrient also causing eutrophication leading to extensive algal growth. Data from the observation showed that maximum amount of phosphate present in monsoon season and declined in Summer season in the year.The seasonal mean of the year 8.5 mg/l to 6.5 mg/l. These high nutrient levels during periods of peak bird densities, attributable to bird droppings, is also supported by Sathya and Sharma (2009), Zuber and Sharma (2007) and Parray*et al.* (2010).

Figure no. 9

Seasonal Variation in Phosphate of Luna Ki Dhani (Water Logged Area of Tibbi) During one Year Study Period



Conclusion

From the present study it is observed that seasonal variation has highly influenced on the physic-chemical characteristic of water. Data of alkalinity and dissolved oxygen showed the favourable environment of water for aquatic life though it is not useful for drinking, irrigation and any culture purpose. High Concentration of Salinity, DO, Phosphate, value indicate that the waterlogged is moderately eutrophicated that is suitable for migratory birds. All value of waterlogged area cross permissible value of (WHO)

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