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Physico-Chemical Characteristics of a Desert Pond Ecosystem in Churu (Rajasthan)

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Abstract

The Thar Desert lies in the North-West part of the Rajasthan. In Thar Desert varied bodies of water are present in the form of ponds, tanks, reservoirs, tanka, naadis, johra, beri and bawari and few perennial lakes etc. Limnological investigations on water bodies were generally aimed to assess the water quality and its interaction with biotic and abiotic factors. The present study was carried out during February 2018 to July 2018 to investigate the physico-chemical characteristics of 'Sethani Ka Johra' in Churu (27^0 24'N to 29^0 00' N latitude and 73^0 40' E to 75^0 41' E longitude) of Rajasthan. Both water and sediment samples were collected. Water was examined for transparency, temperature, pH, electrical conductance (EC), total dissolved solids (TDS), dissolved gases (oxygen and carbon dioxide), total alkalinity and hardness. The sediment samples were examined for pH, EC, TDS and organic matter. The investigations revealed that the Johra was shallow with turbid, alkaline, hard and well oxygenated water. During the present study the Johra maintained the alkaline pH. Free CO_2 was absent during the month of February, March and April.

Keywords: Biotic and Abiotic Factors, Desert, Johra and Phisico-Chemical Characteristics.

Introduction

The Thar Desert lies in the North-West part of the Rajasthan. In the Thar desert varied bodies of water are present in the form of ponds, tanks, reservoirs, tanka, naadis, Johra, beri and bawari and few perennial lakes etc. Limnological investigations on waters bodies were generally aimed to assess the water quality and its interaction with biotic and abiotic factors. Environmental factors and chemical aspects of the water body have major effect on water quality and biological productivity of aquatic system. Thus the present work aimed to assess the physico-chemical characteristics of 'Sethani Ka Johra' in Churu (27^0 24'N to 29^0 00' N latitude and 73^0 40' E to 75^0 41' E longitude) of Rajasthan.

Objective of the Study

1. To study the ecology of water of 'Sethani Ka Johra' Churu is located in North-East part of Rajasthan.
2. To study the physical parameters such as temperature, transparency, pH, EC and TDS of water and pH, EC and TDS of sediment.
3. To study the chemical parameters such as DO, free CO_2, total alkalinity and hardness of water and organic matter of sediment.

Study Area

'Sethani Ka Johra' is situated in the West of Churu city at triangle of Ratangarh and Sardarshahar roads. Smt. Brijkumari constructed this Johra in the memory of her husband Seth Bhagwan Das Bagla in 1886. It was made as relief project during the terrible "Chhapana Akal" the famine 1899 A.D. (V. Samvat 1956). Nowadays this water is used for cattle drinking purpose.

Materials and Methods

The study was carried out during February 2018 to July 2018. Both water and sediment samples were collected from three study stations on the banks of Johra. Water was examined for transparency, temperature, pH, electrical conductance (EC), total dissolved solids (TDS), dissolved gases (oxygen and carbon dioxide), total alkalinity and hardness. The sediment samples were examined for pH, EC, TDS and organic matter. Temperature, pH, EC, and TDS of water were assessed on the spot with the help of respective digital meters (Hanna instruments). The Secchi disc

was used to measure the transparency. Chemical analysis was made following APHA-AWWA-WPCF (1981) and Saxena (1989).

Review of Literature

The limnological research has gained a great momentum all through the world over last few decades. The chemical limnology of arid lands deals specially with evaporation, concentration, precipitation of compounds and relative changes in ionic abundance (Cole, 1979). In the semi arid and arid region of the state, water sheet have been explored by workers. Gupta *et al*. (2001) studied hydro-chemistry of Udaipur lakes. Limnological changes in Shivbari Temple tank, Bikaner over a period of one decade was studied by Khanam (2002). Sharma (2003) reviewed the physical chemical limnology of some desert waters around Bikaner. Srivastava *et al*. (2003) investigated physico-chemical characteristics of water bodies around Jaipur. Singh & Mathur (2005) reported variations in physico-chemical characterisitics of a freshwater reservoir of Ajmer (Rajasthan). Sharma (2009) compared physical chemical limnology of some water sheets in the desert region around Bikaner. Saxena (2009) explained water quality monitoring. Srivastava *et al.* (2009) studied physico-chemical characteristics of lakes around Jaipur. Saxena (2010) presented biological tools in water quality monitoring. Saxena (2011) observed application of bioindicators and trophic state indices (TSI) in water quality assessment. Physico-chemical characteristics of water of Sethani ka Johra, Churu (Rajasthan) was reported by Singh (2012). Jailal, (2016). Studied ecology of "Badrana Johra" in Laxamangarh, Rajasthan.Sharma (2017) studied ecology of Sadul Branch of Sirhind Feeder canal (Hanumangarh, Rajasthan).

Results and Discussion

During the present study the average of transparency was 0.46 m. The temperature of water was ranged from 17.6^0 to 32.0^0 C. Wide range of water temperature was also observed by Sharma & Chauhan, (2008), Kumar *et al.,* (2008) and Chandra, (2015) in desert water. pH was ranged between 8.2 to 8.8. Alkaline nature of desert waters has also been documented by Singh (2000), Rathore (2003), Arora (2009), Srivastava (2009), Bugalia (2010) Sharma (2013) and Sharma (2017). Electrical conductivity of water was ranged from 0.19 mmho/cm to 0.35 mmho/cm. The value of TDS was ranged from 190 mg/l to 350 mg/l. Sharma (2013) and Chandra (2015) were also reported same results in desert area. The average of DO was recorded as 4.65 mg/l. It ranged between 3.18 mg/l to 5.32 mg/l. In desert region low range of DO were also documented by Rathore (2003) and Sharma (2013). Free carbon dioxide ranged between nil to 92 mg/l. Bugalia (1990), Bahura (1990), and Khanam (2002) observed absence of free carbon dioxide in desert ponds. Total alkalinity of water was ranged from 40 mg/l to 90 mg/l. Present observations were almost agreement with findings of Tak (2015) and Sharma (2017). The present investigation reported hard nature of water. Hardness ranged between 44 mg/l to 144 mg/l. The present findings were similar with Chandra (2015).

Average pH of sediment was recorded as 7.77. Sharma *et al.* (2008) and Sharma & Chouhan (2008) also recorded alkaline nature of sediment. Electrical Conductivity ranged between 0.17 mmho/cm to 0.32 mmho/cm. The average value of electrical conductivity was recorded as 0.25 mmho/cm. The value of total dissolved solids ranged from 170 mg/l to 320 mg/l. Average value of organic matter was recorded as 51.15 mg/g. High value of organic matter was documented by Bugalia (1990), Tak (2015) and Chandra (2015).

Conclusion

It is concluded that surface waters are stress resources in desert region. In hard environmental conditions they show specific physical and chemical features. The range of various physico-chemical parameters was in tune with other records from the desert region.

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Table - Physical-Chemical Variables at 'Sethani Ka Johra', Churu during February 2018 to July 2018
Values are Averages of Three Study Stations

Variables		Feb. 2018	March 2018	April 2018	May 2018	June 2018	July 2018	Average
Water	Transparency (m)	0.5	0.5	0.5	0.5	0.5	0.25	0.46
	Temperature (^{0}c)	17.6	26.2	28	30	32	30	27.3
	pH	8.5	8.4	8.2	8.7	8.8	8.5	8.52
	EC (mmho/cm)	0.21	0.19	0.22	0.28	0.35	0.32	0.26
	TDS (mg/l)	210	190	220	280	350	320	261.67
	DO (mg/l)	6.12	4.18	4.58	3.18	4.55	5.32	4.65
	Free CO_2 (mg/l)	NIL	NIL	NIL	92	81	54	37.83
	Total Alkalinity (mg/l)	67	84	90	81	74	40	72.67
	Hardness (mg/l)	44	130	110	144	62	48	101.33
Sediment	pH	8.5	7.6	7.5	6.9	7.8	8.3	7.77
	EC (mmho/Cm)	0.31	0.28	0.17	0.20	0.32	0.22	0.25
	TDS (mg/g)	310	280	170	200	320	220	250
	Organic Matter (mg/g)	44.12	38.32	74.02	60	28.69	18.34	51.15