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COMPARATIVE STUDY OF THE PHYSICO-CHEMICAL QUALITY OF WATER FROM AGRICULTURAL WETLAND, LOTUS CULTIVATION WETLAND AND FISHERIES WETLAND

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Abstract
This study is the assessment of physical and chemical characteristics of different commonly used water sources, including agricultural wetlands, fisheries wetland, and Lotus cultivated wetland, the locality of Bhatar, Purba Bardhaman. Here Lotus cultivated wetland known as Site-A, agricultural wetland was Site-B and fisheries wetland was Site-C. Water samples were collected and measured the following physical and chemical parameters as like temperature, pH, DO, BOD, COD, Phosphate, Chloride, Nitrate, Nitrite, Fluoride, and Zinc. The results showed that temperature was ranging from 19°C to 28°C, pH was 6.6 to 7.6, DO was between 5.9 to 8.1, BOD was 4.1 to 6.9, COD was ranging 0.83 to 1.89, Phosphate was limited 0.090 to 0.150, chloride was reached 6.3 to 9.2, nitrate was extent from 1.18 to 2.10, Nitrite and Fluoride were only found in agricultural wetland and Zinc was not found any of this study site. This work aims to assess the physico-chemical quality of these different sources of water which have also used multipurpose for economic development.
Keywords: Agricultural, Lotus, Fisheries, Wetland, Physico-Chemical, Bhatar, Bardhaman

Introduction

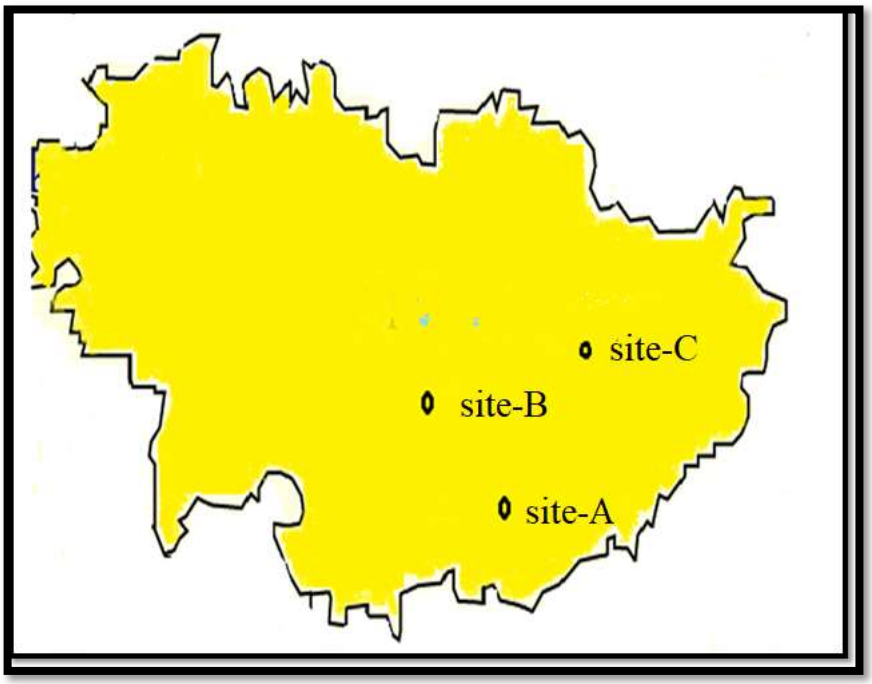
Wetlands are defined as land characteristics between terraneous and hydrophyte ecosystems where the water table is generally at or yonder the periphery or the land is roofed by shallow water. The major six direct profitable functions of wetlands are used for cultivation, source of irrigation, wetland fisheries, domestic usages, jute retting and source of fodder (Mukherjee, 2008). Wetland agriculture is a common livelihood option in numerous countries reasoned for wetlands influenced agricultural productivity (Wobdie, 2018). Most farmers largely depend on the swampy wetlands, which provide them with income (Baffoe et. al., 2021). Aquaculture illustrates the rapidly growing food segment industry in the world. Fishing has been one of the oldest activities of the human race and an important human activity in many countries, which contributes to employment, the economy, and food supply (Manimaran and Suriyan, 2021). According to the Wetland fisheries development report wetlands of Assam, West Bengal, Bihar, Uttar Pradesh, Odisha, Arunachal Pradesh, and Manipur are the most important fisheries point and 7.50 lakh hector of wetland water spread. Major and minor plants are also harvested from the wetlands in rural India, one aquatic herbaceous plant is Lotus (*Nelumbo nucifera*) (Sharan and Haldar, 2021). Twenty different uses of *N. nucifera* mainly for food, medicine, religious rites and both subsistence and cash economics (Trisonthi et. al., 2008). The fast growth of population affects the economic development (Agarwal, 2014) and high population growth in low-

income countries may slow their development (Wesley and Peterson, 2017). In this study area of Purba Bardhaman noticeable that most wetlands are not well maintained and not used properly. Analysis of the water conditions of three wetlands which used different purposes like irrigation for agriculture, lotus cultivation and fisheries. The aim to be this study the condition of the wetlands and it is dynamically used which help different types of production to grow sustainable economic development.

Material and Methods

Study sites

The study was conducted in the rural area of Purba Bardhaman, West Bengal. We analysed three different sites of water – site A, site B, and site C. Site A known as Khan wetland was an almost 40 bigha area situated on the roadside of Bardhaman-Katwa road, nearly 15 Km. distance within the city. A well-maintained wetland for lotus cultivation. Buri wetland (site-B) was almost 3 bigha area and situated 19 Km. from the town. It was a type of agricultural wetland. Sayer (site-C) is just about 30 bigha area and 24 km from the city. It was the oldest wetland in this area. This wetland was mainly used economically through the culture of various types of fish production like Ruhu fish, Catla fish, Bata fish etc.



Methods

The sampling was carried out once each month from July 2021 to April 2022 in each water point. Ten parameters were used for detected water physicochemical condition. These parameters were: temperatures, pH, DO, BOD, COD, phosphate, chloride, nitrate, nitrite, and zinc. Standard methods for the examination of water and wastewater (1991) were used to complete the procedure. At the site temperature and pH were recorded on the similar day. Winkler's methods were used to analyse dissolved oxygen. Potassium, zinc, fluoride, chloride, and phosphate were removed by the flame

photometric method, argentometric method, and stannous chloride method, sequentially. Nitrate and nitrite were detected by sodium salicylate and N-1 naphthyl ethylenediamine method.

Results

Water character measurement can be defined as the change in the physical, chemical, and biological nature of water (Spellman, 2013). The physicochemical study of site-A water revealed that the temperature in summer season 27°C, in the monsoon season 25°C, and winter season 24°C. pH was varied from 7.0 to 7.1, DO from 7.2 to 7.8 mg/l, BOD was 4.1 to 4.2, COD from 0.83 to 1.79, and chloride was 6.9 to 7.5 (Table-1). The study of site-B water revealed that the temperature in the summer season 28°C, in the monsoon season 24°C, and winter season 20°C. pH was varied from 6.6 to 7.2, DO from 5.9 to 6.5 mg/l, BOD was 5.2 to 6.7, COD from 0.93 to 1.89, and chloride was 7.3 to 9.2 (Table-2). The study of site-C water revealed that the temperature in the summer season 26°C, in the monsoon season 24°C, and winter season 19°C. pH was varied from 7.1 to 7.6, DO from 6.9 to 8.1 mg/l, BOD was 4.1 to 6.9, COD from 0.88 to 1.28, and chloride was 6.3 to 8.4 (Table-3).

Discussion

The wetland (site-A) water was alkaline in nature varied between 7.0 to 7.2. Recorded minimum in the summer season and maximum in the winter season. The dissolved oxygen (DO) concentration fluctuated between 7.2 to 7.8 mg/l and the highest concentration (7.8 mg/l) was recorded during the winter season. Biological oxygen demand (BOD) ranged from 4.1 to 4.3 mg/l. The BOD and DO relation were inversely correlated during the consumption of organic wastes aerobic degradation. COD was higher in the summer season than other seasons. Phosphate (0.090 to 0.103 mg/l) and nitrate (1.18 to 1.92 mg/l) higher in the late winter season and the lowest in the monsoon season. Chloride was maximum in the monsoon season and lowest in the winter season. Nitrite, fluoride, and zinc were not found in site-A.

Site-B water was a small amount of acidic in nature varied between 6.6 to 7.2. Recorded minimum in the monsoon season for agricultural chemical pest drainage and maximum in the winter season. The dissolved oxygen (DO) concentration fluctuated between 5.9 to 6.5 mg/l and the highest concentration (6.5 mg/l) was recorded during the winter season. Biological oxygen demand (BOD) ranged from 5.2 to 6.7 mg/l. COD was also higher in summer season than other seasons. Phosphate (0.54 to 0.150 mg/l) and nitrate (1.55 to 2.10 mg/l) higher in the late winter season and the lowest in monsoon season. Chloride was maximum in the monsoon season and lowest in the winter season. Nitrite and fluoride were present in a small amount in the monsoon season and zinc was not found in any season.

The wetland (site-C) water was alkaline in nature varied between 7.1 to 7.5, minimum in the summer season and maximum in the winter season. The dissolved oxygen (DO) concentration fluctuated between 6.9 to 8.1 mg/l and the highest concentration (8.1 mg/l) was recorded during the winter season. Biological oxygen demand (BOD) was ranged from 4.1 to 6.9 mg/l. COD is higher in the summer season. The phosphate (0.65 to 0.110 mg/l) and nitrate (1.18 to 1.92 mg/l) were higher in the late winter season and the lowest in monsoon season. Chloride was maximum in the monsoon season and lowest in the winter season. Nitrite, fluoride, and zinc were not found in the site-C.

In the above study, water physico-chemical water shows that site-A and site-C are well maintained than site-B. site-A is used yearly one-time lotus cultivation and site-C used for fisheries. Site-C wetland is not polluted. Site-A will also be used for fish culture in other seasons and site-B will be used for lotus cultivation and small fisheries. Site-C if properly maintained then fish production also improved. These wetlands if properly used and maintained then more people are involved and more economic growth is possible.

Table 1: Seasonal variation in physicochemical water of site-A

Parameters	Summer	Monsoon	Winter
Water temperature	27°C	25°C	19°C
pH	7.0	7.1	7.2
DO (mg/l)	7.3	7.2	7.8
BOD (mg/l)	4.2	4.3	4.1
COD	1.79	0.83	0.89
Phosphate (mg/l)	0.092	0.090	0.103
Chloride	7.2	7.5	6.9
Nitrate (mg/l)	1.62	1.18	1.92
Nitrite	-	-	-
Fluoride	-	-	-
Zinc	-	-	-

Table 2: Seasonal variation in physicochemical water of site-B

Parameters	Summer	Monsoon	Winter
Water temperature	28°C	24°C	20°C
pH	7.2	6.6	6,7
DO (mg/l)	5.9	6.3	6.5
BOD (mg/l)	6.1	5.2	6.7
COD	1.89	0.97	0.93
Phosphate (mg/l)	0.123	0.54	0.150
Chloride	8.1	9.2	7.3
Nitrate (mg/l)	1.94	1.55	2.10
Nitrite	0.01	-	0.03
Fluoride	-	0.01	-

Zinc	-	-	-

Table 3: Seasonal variation in physicochemical water of site-C

Parameters	Summer	Monsoon	Winter
Water temperature	26°C	24°C	19°C
pH	7.1	7.5	7.6
DO (mg/l)	6.9	8.1	7.9
BOD (mg/l)	6.9	4.5	4.1
COD	1.28	0.88	0.96
Phosphate (mg/l)	0.105	0.65	0.110
Nitrate (mg/l)	1.63	1.45	1.98
Nitrite	-	-	-
Fluoride	-	-	-
Chloride	7.1	8.4	6.3
Zinc	-	-	-

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