Available online at www.climatechangejournal.org

DOI: http://dx.doi.org/10.18782/2583-4770.114

ISSN (E): 2583 – 4770

Emrg. Trnd. Clim. Chng. (2022) *1*(3), 28-33

Research Article

Emerging Trends in Climate Change

Peer-Reviewed, Refereed, Open Access Journal

Physico-Chemical Parameter of Kot Dam in Relation to Hydrophytes in Shakambari Conservation Reserve, Rajasthan (India)

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Received: 10.10.2022 | Revised: 29.11.2022 | Accepted: 8.12.2022

ABSTRACT

This research work deals with the study of the physico-chemical parameter of Kot Dam. Dam water samples were collected from Kot Dam, shakambari conservation reserve, Jhunjhunu district, Rajasthan (India) in winter season from November 2022 to December 2022. Samples were examined for physico-chemical parameters like pH, electrical conductivity (EC), dissolved oxygen (DO), Temperature, Salinity and total dissolved solids (TDS). pH ranged from 7.35 – 8.96, Electrical Conductivity ranged from 122.6 – 202.1 µmhos/cm, Dissolved oxygen ranged from 0.3 – 0.7 mg/l, Temperature ranged from 13.9 °C – 16 °C, Salinity ranged from 4.1 – 6.6 ppt, TDS ranged from 155.6 – 244.2 ppm. The result of the proposed study will establish some facts about the use of water for various purposes like domestic and agriculture. Hydrophytes are an essential link in the aquatic food chain, serving as food for microscopic animals called zooplankton. As a byproduct of photosynthesis, Phytodiversity also release oxygen into the water for use by fish and other aquatic animals. In this paper, an approach is proposed to estimate the physico-chemical parameters of Dam water, which are important factors in controlling eutrophication using modeling and exploration techniques. In Dam water Hydrophyte plant diversity are determined using a physico-chemical approach that provides an alternative method for estimating the diversity. The study revealed that a total of 26 species of hydrophytes belonging to 9 genera and 11 families were identified. Among these, Cyperaceae was the dominant family comprising 6 species, out of which, monocots were represented by 9 species belonging to 3 genera and 3 families; dicots represented by 14 species belonging to 11 genera.

Keywords: *Hydrophytes, biological parameters, physico-chemical parameters, in situ testing.*

INTRODUCTION

Hydrophytes are water plants that's control the aquatic ecosystem. The variety and variability of hydrophytic plants have a major role in controlling aquatic ecosystems. Water is most important for the Life on earth and for regulating the climate of our Environment. It is the most important compounds that profoundly affect Life.

Cite this article: Jangid, A. K., & Shrivastava, P. (2023). Physico-Chemical Parameter of Kot Dam in Relation to Hydrophytes in Shakambari Conservation Reserve, Rajasthan (India), *Emrg. Trnd. Clim. Chng. 1*(3), 28-33. doi: http://dx.doi.org/10.18782/2583-4770.114

The process of rapid industrialization and the indiscriminate use of chemicals, fungicides, fertilizers and pesticides in agriculture cause heavy and diverse aquatic pollution, leading to deterioration of water quality and depletion of aquatic ecosystems. Due to the use of contaminated water, people get water-borne diseases. Therefore, it is necessary to check the water quality periodically. Parameters that can be tested include Temperature, pH, turbidity, Salinity, nitrate and phosphate. Assessment of aquatic invertebrates can also provide an indication of water quality. Hydrophytes are an important component of biological monitoring programs to assess water quality. Hydrophytes have been considered a useful tool for assessing long-term ecosystem changes such as those associated with eutrophication, water management, watershed-scale land-use changes, and climate change. In this sense, Hydrophytes appear as a useful bio indicator because they respond quickly to changes in ecosystem situations, thus allowing rapid assessment of water quality. However, continuous water analysis is not useful because of specific time and cost constraints. However, biological measurements can reveal all aspects of water quality over time and directly measure the ecological impact of ecosystem variables. Biomonitoring provides a reliable and relatively inexpensive means of recording conditions at several locations. Hydrophytes qualify for water quality assessment due to their nutrient requirements, fast reproduction rate, and short life cycle. Hydrophytes are significant indicators of environmental health because they react directly to the qualitative and quantitative constitution of species in an extensive range of water parameters due to changes in water quality, such as increased water pollution.

MATERIALS AND METHODS

The research work was performed at the Kot Dam of Shakambari Conservation Reserve, Jhunjhunu District. Shakambari Conservation Reserve is surrounded by Aravalli Hills and spans over 13,100 hectares of forest land. The total geographical area is 144 square kilometres.

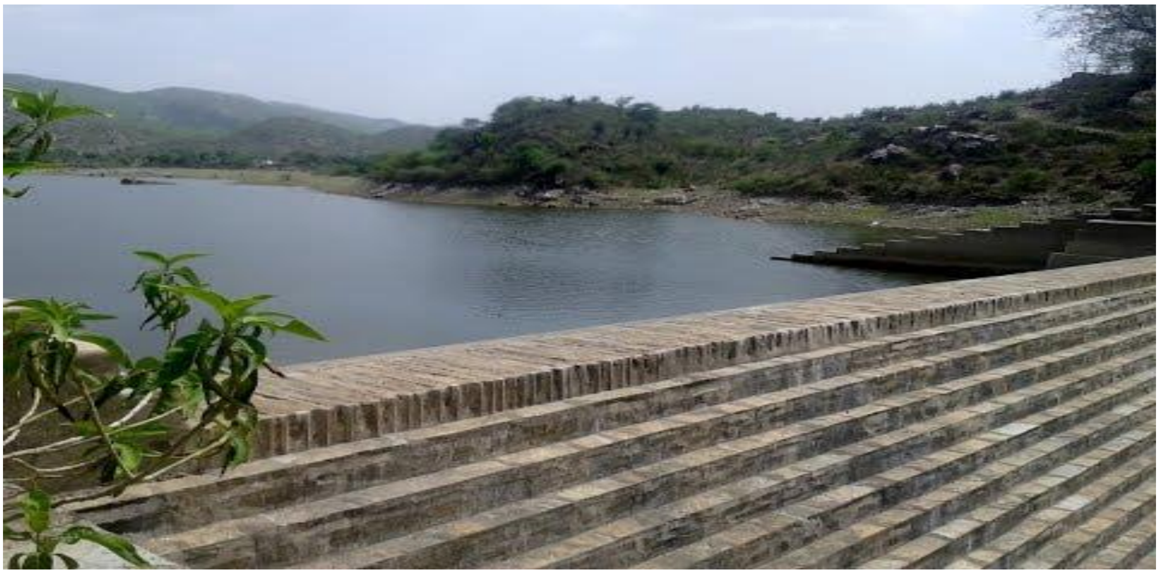

Figure 1- Kot Dam in Shakambari Conservation Reserve

Kot Dam, also known as Sarju Sagar Dam (Bandh) is located in the Shakambari Reserve in Aravalli Hills and is 13 km from the Udaipu rwati town of Jhunjhunu. The dam was built between 1923 and 1924 for the purpose of water storage and irrigation.

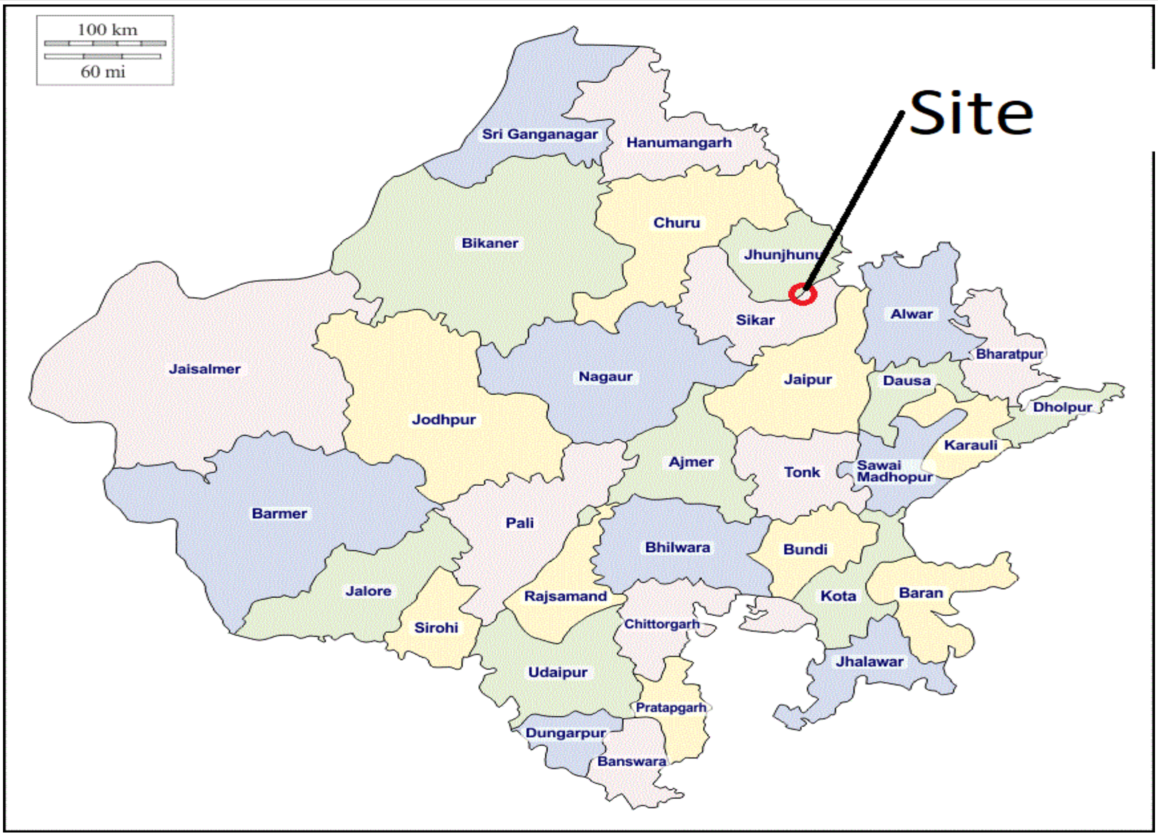

Figure 2- Study site on Rajasthan Map

Water sampling–

Water samples will collect monthly from the Kot Dam for the physical-chemical analysis in the 1-liter bottle before 8 am. Some physico-chemical parameters will study on the spot and others in the laboratory, according to American Public Health Association (APHA), Water Pollution Control Federation (WPCF), and American Water Association (AWA).

Water Testing –

Some physicochemical characteristics of Dam water will be analysed in the period of two years. Physical factors such as Temperature, electrical conductivity (EC), colour, odour, total suspended solids (TSS), total solids (TS), total dissolved substances (TDS), turbidity and chemical parameters such as pH, alkalinity, hardness, dissolved oxygen (DO), bio-chemical oxygen demand (BOD), chemical oxygen demand (COD), salinity, chloride, fluoride, phosphate & nitrate were examined.

a) Temperature–using centigrade thermometer.
b) Turbidity–using turbidity meter.
c) Hydrogen ion concentration (pH)–by using a pH meter.
d) Free carbon dioxide-using titrimetric method.

100 ml sample titrate with 0.1 N NaOH Solution + phenolphthalein indicator

Dissolved oxygen (DO)- by using Winkler modified method.

300 ml sample in BOD bottle + 2 ml. Manganese sulphate + 2 ml. Alkali-iodide-azide reagent → shake bottle of 15 mint., ppt appear + 2 ml. conc. H2SO4 → ppt dissolve. Then this 100 ml. solutions titrant with 0.025 N. Sodium thiosulphates. With starch indicator.

A = ml titrant used
N = Normality of Titrant
V 1 = ml of sample
V 2 = ml of MnSO 4 + alkali iodide azide

Biological oxygen demand (B.O.D.) – By using Winkler's modified method.

Algal sampling-

The algal samples will collect from Kot Dam of shakambari conservation reserve. The Algal samples will be collected by plankton net of

No.18nylon bolting cloth (mesh size 0.072 mm), transferred into the glass bottle, and preserved in 4% formalin solution. The identification of Hydrophytes will on the basis of their morphological feature up to the level of species according to literature in the laboratory and microscopic study.

RESULTS AND DISCUSSIONS

Chemical analysis of water quality, such as organic/inorganic pollutants, and Salinity, inorganic nutrients, organic nutrients is descriptive. However, performing continuous analysis is not beneficial because of the specific time and cost restrictions. However, biological measurements can reveal all features of water quality over time and arrange for a direct measure of the ecological effect of ecosystem variables. Biomonitoring provides a reliable and relatively inexpensive means of recording conditions at several locations.

The diversity of hydrophytic plants reveals that in Dam water there are 26 species belonging to 14 genera and 9 families of flowering plants were observed. Out of 26 species around 5 are having medicinal properties. An analysis of the largest numbers of genera and species within each family shows that out of 29 families, Poaceae family is represented by highest number of genera, Verbanaceae and Scorphulariaceae has lowest number of genera. Family Fabaceae is represented by the highest number of species, whereas Amaranthaceae and Asclepidaceae have shown a lowest number of species. The genera represented by a higher number of species in Indigofera species.

Table 1:- Physico-Chemical Parameters of Kot Dam in Research Duration at 8 A.M. Respectively

S.N.	Physico-Chemical Factor	1 November 2022	15 November 2022	1 December 2022	15 December 2022
1.	Temperature (in ^{0}C)	16.5	16.3	14.7	13.5
2.	pH	8.13	8.05	7.11	7.06
3.	Dissolved Oxygen	0.5	0.7	0.3	0.3
4.	Biological Oxygen Demand (B.O.D.)	265.8	215.63	201.36	198.12
5.	Chemical Oxygen Demand (C.O.D.)	140.5	118.6	109.8	107.3
6.	Free Co_2	0.85	0.96	1.21	1.34
7.	Total Dissolved Solids (T.D.S.)	2586	2598	2612	2612

Biological oxygen demand (BOD):- highest in November in the study period of November to December 2022 (265.8± 198.12mg.l.') and the lowest observed in December. The study of B.O.D. in December is 201.36 ± 198.12mg.l.', and in November 265.8± 215.63mg.l, but more variable. Dissolved oxygen (DO) and free ammonia (FA) followed the opposite pattern and were higher in November (0.5 ± 0.7 mg) and lower in corresponding in December (0.3 mg) D.O. Physico-chemical agent that can be characterized is the pollution level of water bodies.

Secchi Disc Depth

Secchi Disc depth determines in part the quality of the water, both aesthetically and visually. Secchi's average records in spring and summer are 3.96 meters and 4.23 meters, respectively. As a outcome, the reservoir has low transparency in terms of Hydrophytes growth.

The physical and chemical characteristics of the water, the structure of phytoplankton and the diversity of Hydrophytes, as well as the basic hydrological data, allowed the study of the Kot Dam. We studied for three months. The influence of severely polluted dam boundaries, surface water and deep water quality is noted. The hydrodynamic dynamics of the system also discovered by physical and chemical variables and diversity due to algal growth.

CONCLUSIONS

The results show that in Dam water, there are 26 species belonging to 14 genera and 9 families of flowering plants were observed. Out of 26 species around 5 are having medicinal properties. An analysis of the largest numbers of genera and species within each family shows that out of 29 families, Poaceae family is represented by the highest number of genera, Verbanaceae and Scorphulariaceae has lowest number of genera. Family Fabaceae is represented by the highest number of species, whereas Amaranthaceae and Asclepidaceae have shown a lowest number of species. The genera represented by a higher number of species in Indigofera species. Observed plants were preserved as Digital herbarium with their botanical names, family, local names and habitat.

The main features of each section are as follows:

Result 1: surface water quality and hydrophytes, increased concentration of ions and increased oxygen concentration,
limited phytoplankton density due to overflow from the Kot dam and The toxic effect substances on Hydrophytes is reduced.

Result 2: Deep water quality low oxygen concentration; extremely high nutritional component, nitrogen is mainly in the form of ammonia of nitrogen; eutrophication or super nutrient systems; dominance ; Heavy metal concentrations far exceed levels that are protective for aquatic Life.

Result 3: Increased depth, breadth, speed and depth of water; improve water quality with the restoration of dissolved oxygen concentrations; nutritional value and chlorophyll corresponding to the eutrophication system; evidence of toxic effects on Hydrophytes.

Acknowledgements:
We are thankful to the Department of Botany J. D. B. Govt. Girls College, Kota, for providing library and laboratory facilities and valuable suggestions during the Research work.

Funding: NIL.

Conflict of Interest:
There is no conflict of interest with this manuscript.

Author Contribution:
Both authors contributed equally to establishing the research and design experiment topic.

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