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Impact of Water Quality on Vegetation of Jait Sagar Lake and Mangli River of Bundi, Rajasthan

Savita Gupta*

Associate Professor, Botany, Govt. College, Kota

*Corresponding Author E-mail: savitaguptakarnesh@gmail.com

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ABSTRACT

The present study was aimed to assess the existing biological status and physico chemical parameter (e.g. pH, Turbidity, Total Alkalinity, Total Hardness, Calcium, Magnesium, chloride, Sulphates, Nitrate, T.D.S. and Coliform organisms.) of water of Mangli River (Lotic) and Jaitsagar Lake (Lentic) and its effect on the vegetation. The physicochemical parameter of water determined its suitability for any intended use. Different environmental factors along with biotic factors mutuality interact and influence the diversity of flora and fauna. During the course of study, it was found that some hydrophytes species, which were in luxuriant growth, present in Mangli River and Jaitsagar Lake also. This shows that the Mangli River and Jaitsagar Lakes are polluted in many ways.

Keywords: *Eutrophication, Lentic and Lotic system, Pollution.*

INTRODUCTION

Water is one of the most important and basic natural resources. It is not only one of the most essential commodities of our day-to-day, but the development of this natural resource also plays a crucial role in economic and social development processes. It is there for imperative that man develops uses and manages this scare commodity as rationally and efficiently as possible.

Water pollution is any chemical, physical or biological change in the quality of water that has a harmful effect on any living thing that drinks or uses or lives in it. When humans drink polluted water it often has serious effects on their health. Water pollution can also make water unsuited for the desired use.

Physical Water Pollution is caused by hot water industries, oil spills from oil carriers etc; Chemical Water Pollution is due to organic chemicals e.g., biocides, PCBs and inorganic chemical e.g., phosphates, nitrates, fluoride and heavy metals ;and Biological Water Pollution is caused by the pathogens such as viruses, bacteria, algae, protozoa and helminthes.

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Estimates suggest that nearly 1.5 billion people lack safe drinking water and that at least 5 million deaths per year can be attributed to water borne disease. With over 70% of the planet covered by ocean, people have long acted as if these bodies of water could serve as a limitless dumping ground for wastes.

Out of India's 3,119 towns and cities, just 209 have partial treatment facilities, and only 8 have full wastewater treatment facilities. 114 cities dump untreated sewage and partially cremated bodies directly into the Ganga River. In Downstream, the untreated water is used for drinking, bathing and washing. This situation is typical of many rivers in India as well as other developing Countries.

Rajasthan is a semi-arid desert state. The Aravalli range virtually cuts it into two halves. While the eastern board of the Aravallis drained by several integrates drainage systems, the western board opens out into the great Desert - the Thar, which has only one major river basin: The Luni.

The major reasons of water pollution are fertilizers, laundry detergents, pharmaceuticals, sewage etc. Water pollution have major effects on aquatic ecosystem like nutrient deficiency, decrease of species diversity, change in species composition, eutrophication and oxygen depletion etc.

The present study was carried out to study the impact of water pollution on the various physio-chemical parameters and its effect on the vegetation of the study area.

STUDY AREA

A tiny picturesque town, Bundi is about 36 Km. from Kota and 210 Km from Jaipur. It is one of the unexplored cities with a rich historical wealth It is located at $25^{O}44'$ N 75^{O} 36' E and an average elevation of 268 meters (879 Feet). The city lies near a narrow gorge, and is surrounded on three sides by hills of the Aravali Range. A substantial wall with four gateways encircles the city.

First study site is Jaitsagar Lake; and it's distance is 2 K.m. / 2K.m. from Bundi. Its catchments area is 5.00 (sq, Mile). Gross storage capacity is 35.69 Mc.ft. It is Masonry Lake. The average rainfall is 661.00 mm.

Second study site is the Mangli River, tributary of Mej river. Its total length is 63 Km, with an average 90 mtr width. It's a seasonal river, originates from Bhupatpura, Bhilwara.

MATERIALS AND METHODS

Water from different sources was collected and analyzed for various parameter viz. Physical - Colour, Odour and Temperature; Chemical- pH, Turbidity, Total alkalinity, Total hardness, Magnesium hardness, Chloride, Total sulphate, Nitrate, Total Dissolved solids. (T.D.S.) and Biological parameter like Most Probable Number (M.P.N.).

Various physicochemical parameters were determined by methods devised by APHA (2005), and Trivedy and Goel (1986).

OBSERVATION AND RESULT

The present study was aimed to assess the existing biological status and physicochemical parameter of water of Mangli River (Lotic) and Jaitsagar Lake (lentic) where no prior date exists. The physico chemical parameter of water determined its suitability for any intended use. The results are presented in Table no.1 and Fig.1.

pH factor is important factor of water quality and survival of biological agent depends upon it. In the present study of Mangli river (8.6) and Jait sagar lake water (8.6) is alkaline is nature (Table 1).

Turbidity is the measurement of cleaning of water and it is due to colloidal and extremely fine dispersions. Suspended matter such as clay silt finely divided organic and inorganic matter plankton and other microscopic organisms contribute to turbidity. In the present study turbidity of Mangli River and Jaitsagar Lake ranged from 2 to 4 N.T.U.

The determination of **alkalinity** provides an idea of the nature of salt present. Alkalinity of Jait Sagar Lake is higher (460 mg/l) than Mangli river (410 mg/l). **Hardness** is defined

as characteristics of water representing the total concentration of calcium and magnesium ions expressed as milligrams of $CaCO_3$ per litre. Calcium is regarded on the basic nutrient of normal metabolism. Similarly magnesium is essential for bacteria, algae and plants. Total hardness of Jaitsagar Lake (370 mg/l) is higher than Mangli river (340 mg/l).

Calcium is essential for all organisms and regulates various physiological functions. It has direct effect on pH and carbonate system. The calcium ion contribute to the hardness of water which are higher in Mangli river (200 mg/l) as compare to Lake water (172 mg/l).

Chlorophyllous plants require magnesium as the magnesium is used for porphyrin component of the chlorophyll molecules and as a micronutrients in enzymatic transformation of organism. The upper permissible limit of magnesium hardness for drinking water is 150 mg/l and it is higher in Mangli river (188 mg/l).

The amount of chloride content of any water gives an idea about the nature and extent of pollution. In the present study, chloride value of Mangli river (150 mg/l) is higher than of Jait sagar Lake (100 mg/l).

All living organisms in the form of both mineral and organic sulphates utilize Sulphur. Decomposition of organic matter containing proteinaceus sulphur and anaerobic reduction of sulphate in water contributes to altered conditions that markedly affect the cycling of nutrient productivity and bottom sediments. Sulphates are higher in Lake water (35mg/l).

Nitrate is an excellent parameter to judge organic pollution in water body. Surprisingly there is negligible amount of nitrates in both the study sites.

All aquatic bodies in nature contain both inorganic and organic dissolved solids. The composition of biotic community and anthropogenic activity in the river greatly influences the chemistry of water with **TDS**. TDS of JaitSagar Lake 580 mg/l.

Coliform organisms were determined in Most Probable Number (MPN). M.P.N. values of both the study sites ranges from 2400 to infinite per 100 ml.

Vegetation aspect

Different environmental factors along with biotic factors, mutuality Interact and influence the diversity of flora and fauna. The water bodies Mangli River and Jaitsagar Lake receive water mainly through rains flowing in to it and carry along with fertilizers from near by agriculture practices, sewage wastes, silt and clay. Also miscellaneous anthropogenic activities like bathing, washing etc. Thus, they are facing eutrophication problems in many ways. During the course of study it was found, that *Nelumbo nucifera* have luxuriant growth seen throughout the study period showing eutrophication in the Jaitsagar Lake (Table 2).

Most frequently found hydrophyte in Mangli river is *Ipomoea aquatica,* which is pollution indicator. This shows that the river is polluted in many ways.

DISCUSSION

The water bodies and their ecology are in varying degrees of environmental degradation mainly due to the eutrophication. Both lentic and lotic water bodies are subjected to influence to wide array of physical and chemical factors whose fluctuating values affect the biotic composition. Water quality deterioration in these water results in to a steep decline in biodiversity of flora and Macrophytes.

Anthropogenic nutrient enrichment causes serious alteration in the aquatic ecosystem (Khan and Ansari 2005) similar observations is seen in the present study period.

The chemical properties are governed by rain evaporation, adjoining water and intensities of pollution. Analysis of chemical parameters can act as an indicator of water quality. Quality of water is getting vastly deteriorated due to unscientific waste disposal, Improper water management and carelessness towards environment (Agarwal et al, 1976). In the present study same type of findings are observed where deterioration in water quality is affecting vegetation. The physical and chemical characteristics of water determine its suitability for its use. The microbial

examination of water is direct indicator of faecal contamination and its extent of risk to human health. In the present investigation a detailed study of water quality of the sites were made where anthropogenic activities are found at large scale.

Table-1 Physico-Chemical Parameters at Studied sites from Sept.2009-Aug.2010

Parameters	Jaitsagar Lake		Mangli River	
	Max	Min	Max	Min
pH	8.6	7.4	8.6	7.4
Turbidity (NTU)	4	2	4	2
Alkalinity (Mg/L)	460	190	410	120
Total Hardness (Mg/L)	370	120	340	140
Calcium Hardness (Mg/L)	172	70	200	80
Magnicium Hardness (Mg/L)	158	50	188	60
Chloride (Mg/L)	100	40	150	50
Total Sulphate (Mg/L)	35	8	30	8
Nitrate (Mg/L)	7	1	5	2
TDS (Mg/L)	520	200	520	380
Coliorm (MPN)	Infinite	2400	Infinite	2400

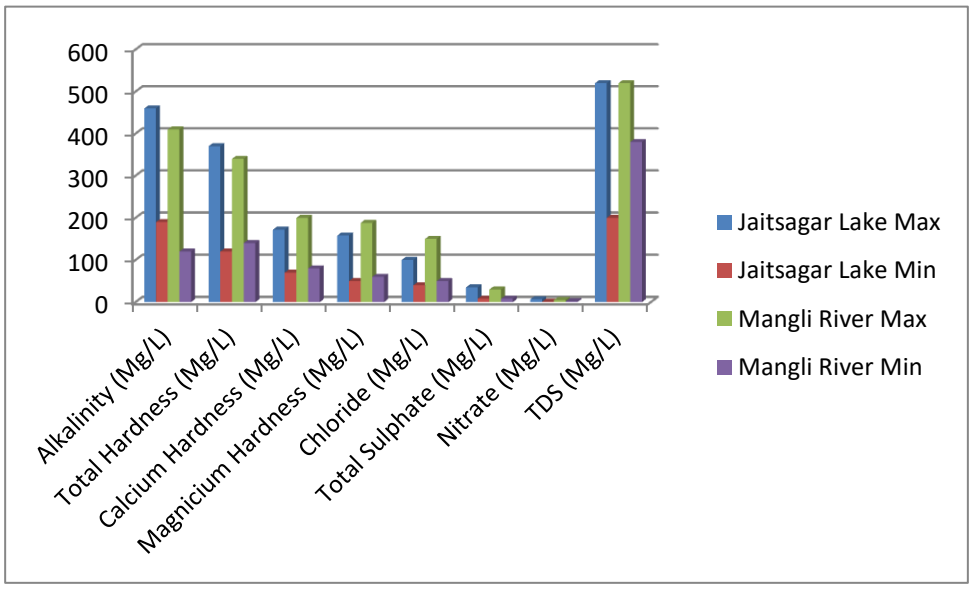

Fig.1- Graph showing Maximum and Minimum Physico- Chemical Parameters (Mg/L.)

Table-2 Occurrence of Hydrophytes and Mesophytes at Studied sites from Sept.2009-Aug.2010.

S.No.	Species	Family	Habitat	Jaitsagar Lake	Mangli River
1.	*Nelumbo nucifera* Gaertn.	Nelumbonaceae	Hydrophytes	+	-
2.	*Nymphaea alba* L.	Nympheaceae	Hydrophytes	+	-
3.	*Ceratophyllum demersum* L.	Ceratophyllaceae	Hydrophytes	+	+
4.	*Trapa natans* L.	Trapaceae	Hydrophytes	+	-
5.	*Hydrilla verticillata* (L. f.) Royle	Hydrocharitaceae	Hydrophytes	+	+
6.	*Vallisneria spiralis* L.	Hydrocharitaceae	Hydrophytes	+	+
7.	*Typha angustiolia* L.	Typhaceae	Hydrophytes	+	+
8.	*Sagittaria sagittifolia* L.	Alismataceae	Hydrophytes	+	-
9.	*Potamogeton crispus* L.	Potamogetonaceae	Hydrophytes	-	+
10.	*Potamogeton natans* L.	Potamogetonaceae	Hydrophytes	-	+
11.	*Ipomoea carnea* subsp. *fistulosa*	Convolvulaceae	Hydrophytes	+	+
12.	*Ipomoea aquatica* Forssk.	Convolvulaceae	Hydrophytes	+	+
13.	*Cyperus* spp.	Cyperaceae	Hydrophytes	+	+
14.	*Eucalyptus rudis* Endl.	Myrtaceae	Mesophytes	-	+
15.	*Coccinia cordifolia* (L.) Voigt	Cucurbitaceae	Mesophytes	-	+
16.	*Eclipta alba* (L.) Hassk.	Asteraceae	Mesophytes	+	+
17.	*Tridax procumbens* L.	Asteraceae	Mesophytes	+	+
18.	*Solanum xanthocarpum* Schrad. and Wendl	Solanaceae	Mesophytes	-	+
19.	*Lindenbergia indica* (L.) Vatke.	Scrophulariaceae	Mesophytes	+	+
20.	*Ocimum americanum* L.	Lamiaceae	Mesophytes	-	+
21.	*Amaranthus viridis* L.	Amaranthaceae	Mesophytes	+	+
22.	*Gomphrena globosa* L.	Amaranthaceae	Mesophytes	+	+
23.	*Acalypha ciliata* Forssk.	Euphorbiaceae	Mesophytes	+	-
24.	*Jatropha curcas* L.	Euphorbiaceae	Mesophytes	+	+
25.	*Phyllanthus urinaria* L.	Euphorbiaceae	Mesophytes	+	-
26.	*Polyganum glabra* Willd.	Polygonaceae	Mesophytes	-	+
27.	*Phoenix sylvestris* (L.) Roxb.	Arecaceae	Mesophytes	+	-
28.	*Phyla nodiflora* Greene	Verbenaceae	Mesophytes	+	+
29.	*Achranthus aspera* L.	Amaranthaceae	Mesophytes	+	+

CONCLUSION

The water samples collected from the study sites were analyzed and data has presented in Table -1. It reveals that pH value of site 1 and 2 is 7.4 to 8.6 respectively. As per the quality of water is concerned according to classification of irrigation water quality ph value between 7.4 to 8.6 is said to be safe. Higher range of pH indicates higher productivity of water (Rafeeq and Khan 2002). Srivastava et al, (2003) reported that chloride concentration above 60 ppm indicate heavy pollution, the chloride conc. At both sites indicates heavy pollution.

The values of nitrate is towards the higher side ranging from 1 to 7 in the lentic system indicating that the stagnant water body is more eutrophic and the growth of, *Nelumbo nucifera, Ceratophyllum demersum, Ipomoea aquatica* indicates that the water is highly polluted.

Twenty nine aquatic plants were found at both the sites which wete *Ceratophyllum demersum, Typha angustata, Hydrilla verticillata, Vallisneria spiralis, Ipomoea fistulosa, Ipomoea aquatica, Cyperus* species, *Eclipta 21iliate21e, Tridex procumbens, Acalypha 21iliate, Phyllanthus urinaria, Phyla modiflora* etc. Among them 13 sps were hydrophytic in nature and 16 sps. Were mesophytic.

It is observed that in Jaitsagar Lake (lentic) most abundant species are *Nelumbo nucifera, Nymphaea alba, Trapa natans, Sagittaria, Lindenbergia indica, Amaranthus viridis* and *Phoenix syllivestris*.

Whereas in Mangle River (lotic) there species were not found. The chemical analysis of Jaitsagar also revealed that there are higher values of pH, total alkalinity, total hardness, nitrate and sulphate; indicating that water is more polluted as compared to Mangli River. It shows that stagnant water carries more pollution than flowing River.

Resent investigation shows that the potential of aquatic plants indicate the quality of water. The succession changes in depth and structure of biotic community exert a multirole pressure on ageing process of River.

It is concluded that Jaitsagar Lake at Bundi is highly polluted as compared to Mangli River. So effective measures should be taken to save this water body.

REFERENCES

Agarwal, D.K., Gaur, S.D., Tiwari, T.C., Narayanswami N and Marwah SM, (1976). Physico-Chemical characteristics of Ganges water at Varanasi, *India. J. Environ. Hlth. 18* (3). 210-216.

APHA, (2005). Sandard method for the examination of water and waste water. 21st Edn. Washingon, DC.

Khan, F.A. and Ansari, A.A. (2005). Eutrophication: An Ecological Vision. *The Botanical Review*, *71*, 449-482.

Rafeeq, M.A. and Khan, A.M. (2002). Impact of sugar mill effluents on the water quality of the river Godavari near Kandakurthi village, Nizamabad district, *Andhra Pradesh. J. Aqua. Biol.*, *17*, 33-35.

Srivastava, N.M., and Tyagi, A. (2003). Study of Physico-Chemical characteristics of water bodies around Jaipur. *Journal of Environmental Biology. 24*:2. 177-180.

Trivedy, R.K. and Goel, P.K. (1986). Chemical and Biological methods for water pollution studies. Environmental Pulications, Karad.