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Macrophyte Diversity of a Tropical River from Nagpur India

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ABSTRACT

In present investigation, distribution and diversity of macrophytes in Kolar river in Nagpur region of Maharashtra state, India have been studied, to investigate overall health of the water body. Since the studies on macrophytes diversity are very less in Kolar river this paper is intended to report macrophytes diversity in present investigation, the present study was conducted on monthly basis for the period of two years from February 2010 to January 2012 by following standard protocols. The statistical analysis of the analytical data was computed and it reveals that submerged macrophytes are abundant followed by marginal and free floating. The species diversity is more at sampling Site-B in shallow water and less water current. In the present investigation, 25 species from three groups were recorded from Kolar lotic ecosystem under study which was categorized by free floating, submerged and marginal aquatic weeds. The data of the present investigation show that the enrichment of the shallow water with high bottom sediments provides an ideal habitat for luxuriant growth of macrophytes. It is also demonstrated that the diversity of macrophyte is less where water current is more and diversity increases as the water current decreases and organic contents increases.

KEY WORDS: MACROPHYTES, RIVER KOLAR, SPECIES DIVERSITY.

INTRODUCTION

In a natural ecosystem macrophytes have been shown to remove both toxic and nontoxic elements in the sediment and water, Narayan and Somshekhar, (1997). These are unchangeable biological filters and carry out purification of the water bodies by accumulating dissolved metals and toxins in their tissues, Shaha & Vyas (2015). The variation in water chemistry can be assessed by surveying the abundance of macrophytic communities. The trophic nature is mainly influenced the variety of communities and indicator species occur at the sources. Moreover, metabolic activities of macrophytic communities accelerate the metabolic and the physico-chemical conditions of stream Gregg and Rose, (1982). Some relevant and recent studies on aquatic macrophytes have been made by, Tenna Riis et al., (2019), Ester Vieira Noleto et al., (2019), Szymon Jusik and Staniszewski, (2019), Hanife Ozbay et al., (2019), Rameshkumar et al. (2019), Patel and Dubey (2019),), Prasad and Das (2018), Bhute and Harne (2017).

The macrophytes stimulate the growth of phytoplankton and help in the recycling of the organic matter. The submerged species of macrophytes at the margin also act as a green manure favorable the abundance of zooplankton and benthic fauna, supported by Bhute and Harne, (2017) from Nagrala Lake. Macrophytes serve as a substratum, manure and also provide food and

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shelter for many aquatic organism, Kudryavtsev and Yeshov, (1980) and Raut and Pejaver, (2005) Seasonal fluctuation in riverine water flow is responsible for limited macrophyte diversity, Rulikm et al., (2020). Macrophyte diversity significantly affects overall aquatic biodiversity, Prasad and Das, (2018). Since the studies on macrophytes diversity are very less in Kolar river this paper is intended to report macrophytes diversity in present investigation.

MATERIALS AND METHODS

The river Kolar is in the vicinity of Khaparkheda town, located at 21.3858107^0 north latitude and 78.9201379^0 east longitudes in Nagpur district of Maharashtra state. This river flowing besides the thermal plants (Khaparkheda TPS and Koradi TPS) and some villages in the downstream are located on the bank of this river and receiving effluents and domestic water. Therefore, the river was monitored by collecting samples from four locations covering the complete stretch of the river receiving discharges during the period of two years from February 2010 to January 2012 in winter, summer and monsoon seasons to know the seasonal variation. These sampling locations are Site - A (Dam Site), Situated at Nanda Dam, Site - B (Village Site), Situated near Kolar bridge on N.H.69 at Mahadula, Site - C (Village Site), Situated at Khaparkheda, Site - D (Confluence point Site), Situated at Confluence point of river Kolar and Kanhan at Waregoan. The macrophytes biodiversity of river Kolar was evaluated and assessment was made by analyzing parameters of interests.The sampling program was planned taking into account the objectives of the study and the parameters to be analyzed. Efforts were made to centralize the aim of sampling to achieve the representativeness and validity of the samples. Macrophytes were collected at monthly intervals during the period of investigation from shallow littoral zone by hand picking. After collection specimens were thoroughly washed with water, excess water was soaked with filter paper, kept in polythene bags, brought to laboratory in ice box and specimens identified up to species with the help of standard literature Edmondson (1959), APHA (1996), IAAB publication no.2, (1998) and Fassett (2000).

RESULTS AND DISCUSSION

In the present investigation, 25 species from three groups were recorded from Kolar lotic ecosystem under study which was categorized by free floating, submerged and Marginal aquatic weeds (Table-1 and Table-2). *Azolla species* were not recorded from Kolar river while *Eichhornia crassipes* was recorded. The *Azolla spp*. is considered as pollution free species and Eichhornia as pollution tolerant species Narayana and Somashekhar, (2002). The macrophytes also provide suitable breeding and sheltering place for macroinvertebrates and fishes Meshram, (2003). Macrophytes in fresh water play major ecological role and help in the regulation and stabilization of trophic state and mineral cycling in the aquatic ecosystem Melzer, (1981), Wielgleb, (1984). They serve as the bioindicators for the possible degree of damage in aquatic ecosystem Pieczynska and Ozimek, (1976). During investigation period of the total mcrophytes; free floating-20%, submerged-48% and Marginal aquatic weeds-32% were observed (Figure-1).

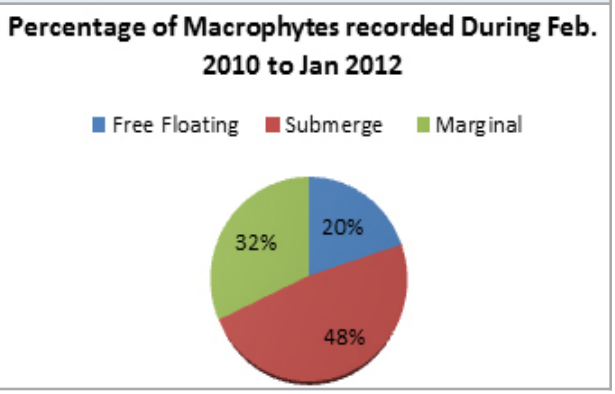
The free floating macrophytes were represented by, *Wolffia spp*, *Lemna spp, Spirodella spp*, *Pistia stratiotes* and *Eichhornia crassipes*.

The submerged macrophytes were represented by, *Hydrilla verticellata, Vallisneria spiralis, Potamogeton natans, P. crispus, P. pectinatus, P. richardsonii, Ceratophyllum demersum, Najas spp, Utricularia spp and Chara vulgaris. Myriophyllum, Hyperium spp*. The marginal aquatic weeds were represented by, *Rotala ramosior, Lythrum alatum, Penthorum spp, Cyperus diffuses, Typha angustata, Ludwigia spp. Marsilea quadrifolia* and *Ipomoea aquatic*, *Ludwigia spp*. Macrophyte diversity was found low in sampling site D which was confluence point of river Kolar and river Kanhan, where water current was fast. Maximum number of macrophyte species was recorded at sampling site-B (Village site near Kolar bridge where water current is slow, water is shallow and some anthropogenic activities were found Table-3 and Figure-3).

Table 1. Total numbers of Macrophytes recoded during Feb 2010 to Jan 2012

Type	Free Floating	Submerge	Marginal
Number of Species	05	12	08
Total	25		

Figure 1. Percentage of Macrophytes recorded During Feb. 2010 to Jan 2012



The data of the present investigation show that the enrichment of the shallow water with high bottom sediments provides an ideal habitat for luxuriant growth of macrophytes. It is also demonstrated that the diversity of macrophyte is less where water current is more and diversity increases as the water current decreases and organic contents increases, these data are well supported by the work of Tenna Riis et al., (2019) from River Gudena, Denmark, where shallow water was found to

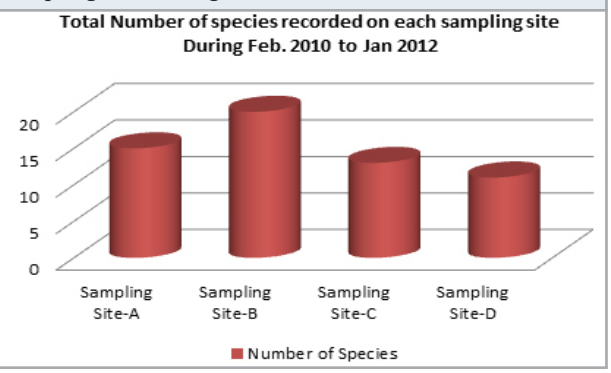
Table 2. The diversity of Macrophytes in the Kolar river During Feb. 2010 to Jan 2012

SN	Macrophytes	Family	Site A	Site B	Site C	Site D
A	Free Floating					
1	*Lemna spp,*	Salvanaceae	+	+	-	
2	*Pistia stratiotes*	Lemmaceae	+	+	-	
3	*Eichhornia crassipes.*	Lemmaceae	-	+	+	+
4	*Wolfia spp.*	Lemmaceae	+	+	-	
5	*Spirodella spp.*	Lemmaceae	-	+	+	+
B	*Submerged*					
1	*Najas spp.*	Najadaceae	+			+
2	*Potamogeton richardsonii*	Najadaceae		+	+	
3	*P. crispus*	Najadaceae	+	+	+	
4	*P. pectinatus*	Najadaceae		+	+	
5	*P. natans*	Najadaceae	+			+
6	*Ceratophyllum demersum*	Hydrocharitaccae	+	+	-	
7	*Hydrilla verticellata*	Hydrocharitaceae	+			+
8	*Valisnaria spiralis*	Hydrocharitaceae	+	+	-	
9	*Utricularia spp.*	Lentibulariaceae	+			+
10	*Hyperium spp,*	Hyparaceae		+	+	
11	*Chara vulgaris.*	Characeae	+			+
12	*Myriophyllum*	Hydrocharitaccae	+	+	-	
C	*Marginal*					
1	*Rotala ramosior*	Lythraceae		+	+	
2	*Lythrum alatum*	Lythraceae	+	+	+	+
3	*Typha angustata*	Iridaceae		+	+	+
4	*Ipomoea aquatica.*	Compositae	+	+	+	
5	*Penthorum spp.*	Crassulaceae		+	+	+
6	*Cyperus diffusus*	Cyperaceae		+	+	
7	*Ludwigia spp.*	Onagraceae	+	+	-	
8	*Marsilea quadrifolia*	Marsileaceae		+	+	+

Table 3. Total Number of species recorded on each sampling site During Feb. 2010 to Jan 2012

Sampling Site	A	B	C	D
Species Diversity	15	20	13	11

Figure 2. Total Number of species recorded on each sampling site During Feb. 2010 to Jan 2012



be enriched with high bottom sediments for luxuriant growth of aquatic plants. This has also has been recently reported by Patel and Dubey, (2019). Environmental factors such as topography, season, rain fall expected to create numerous ecological niches, also leads to high diversity of aquatic plants as shown by Prasad and Das (2018). The findings of the present investigation that the shallow water when enriched with high bottom sediments provides an ideal habitat for luxuriant growth of macrophytes has also been reported by the recent findings of Rulik et al., (2020).

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