Distribution of Emergent Macrophytes of Three Eutrophic Lakes from Jhansi, Bundelkhand Region

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ABSTRACT

Aquatic Macrophytic species were studied in three lakes of Jhansi, Bundelkhand region namely Burwa sagar, Atyatal, Laxmital (24°11´ and 25° 57´ N latitude and 78°10´ and 79° 25´ longitude). The present investigation was undertaken in June 2006, deals with distribution characters of macrophytes in the studied wetland ecosystems. Overall 10 species belonging to 9 families were recorded from the lakes. Atyatal was having maximum number of 9 species followed by 5 species in Laxmital and three in Barwasagar. The frequency values evaluated for various species were: 0.84 for *Eichhornia crassipes*; 0.72 for *Ipomea aquatica*; 0.53 for *Elatina triandra*; 0.26 for *Potamogeton pectinatus* and 0.28 *Amaranthus virdis*. The maximum values for density were recorded for *Eichhornia crassipes* (0.47), *Ipomea aquatica* (0.47), and *Potamogeton pectinatus* (0.47) all from Atyatal whilst mimimum density values were recorded for *Potamogeton pectinatus* (0.05) from Barwasagar .The maximum contribution to IVI (Importance Value Index) was recorded from Burwasagar for the species like *Ipomea aquatica* (111.96), *Eichornia crassipes* (99.56) and lowest values were recorded from Atyatal for the Species like *Parthenium hystrophorus* (21.96) and *Phalaris arundinaceae* (25.02).

All the studied lakes were having greater coverage of emergent macrophytes indicating that lakes are evolving at rapid pace, owing to

change in water quality, water level fluctuation and swallowing of lakes by sedimentation.

Key words**:** Macrophytes, Barwasagar, Atyatal, Laxmital, Importance value index, catchment, tributaries

INTRODUCTION

Macrophytes play an important role in functioning of an aquatic ecosystem (Pandit, 2010). There are various features in aquatic system which get influenced by macrophytes, besides having socio-ecological values they contribute to biotopes by way of their primary production (Adams and Mc-Craken, 1974), detritus formation (Wetzel et al., 1972) as nutrient source (Carignan and Kalff, 1980) fish food (Yousuf and Firdous, 1997) also serve as substrate for the development of periphyton and phytophilous invertebrates (Pandit, 1984). Aquatic plants also serve as indicators of water quality because of their sensitivity to water quality parameters, such as water clarity (Dennison et. al., 1993) and nutrient levels (Pandit, 2010) and are often used for monitoring heavy metals and other pollutants present in the water and submerged sediments (Bernez, 1999). Macrophytes act as nutrient pumps for the ecosystem for taking in nutrients from deep layers and releasing them at surface after death and decay. Macrophytes are also used as manure and in medicines. In contrast to lentic (standing) waters the role of Macrophytes in running (lotic) waters in very limited and only a few species of Macrophytes are adopted to lotic Habitats (Hynes, 1970). A number of studies pertaining to distribuation and diversity of macrophytes have been carried out by various workers (Pandit, 2010; Ali and Pandit, 2009; Birk, *et. al.,* 2006; Kumar and Pandit, 2006; Rather and Pandit, 2005; Lee and Mc-Naughton, 2004).

Keeping in view the ecological importance of Macrophytes in aquatic systems, present study was undertaken in Barwasagar, Atyatal, Laxmital lakes.

STUDY AREA

Study area lies between latitudes 24^{o} 11´ and 25^{o} 57´N, and longitudes 78^{o} 10´ and 79^{o} 25´ (Fig-1). From the study area three water bodies namely Laxmital, Burwasagar , Atiyatal were examined for the presence and frequency occurrence of macrophytes.

Laxmital located in the direction of Kamasan hills, covering an area of 32.52 hectares with an average depth of 3.8 m. Burwasagar is located on the bank of Betwa river in the direction of Orcha, covering an area of about 60.47 ha, with an average depth of about 4.2 m. Atyatal is situated in the heart of Jhansi, having an area of about 15.41 hectares, with an average depth of 3.1m. Laxmital and Atyatal are typical urban lakes while Barwasagar is a Rural lake.

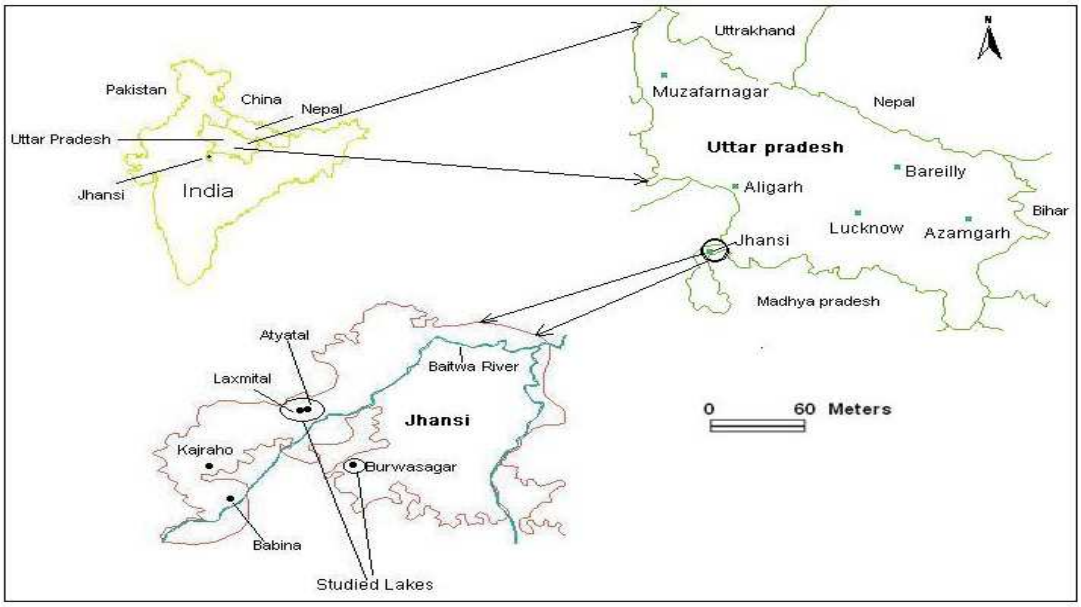

Fig:1. Location map of study area

MATERIAL AND METHODS

Macrophyte sampling was conducted in June, 2006 which forms the peak growth season of the macrophytes in these lakes. 28, 36, 17 quadrates of $2m^2$ were laid respectively in Laxmital, Barwasagar and Atyatal. Quadrates were laid randomly and extending from shore line towards the lake center. The macrophytes falling in each Quadrat were sorted species wise and the number of individuals of each species counted to work out frequency, abundance, density (Misra, 1968) and IVI (Importance Value Index).

RESULTS AND DISCUSSION

Present study revealed the presence of 10 species, belonging to 9 families; 5 species were present in Laxmital, 3 species in Burwasagar and 9 species in Atiyatal (Table.1). In an aquatic system the occurrence and distribution of macrrophytes is governed by number of aquatic factors. Among these factors, water depth and its periodic fluctuations have been postulated to be most important regulating distribution of both emergent and submerged communities (Zutshi and Gopal, 1990).

Table 1. Macrophytes assemblage of three studied lakes

S.No.	Species Name	Laxmital	Burwasagar	Atyatal
1	*Elatina triandra*	P	P	A
2	*Potamogeton zotiformiss*	A	A	A
3	*Eichhornia crassipes*	P	P	P
4	*Typha latifolia*	P	A	P
5	*Amaranthus virdis*	P	A	P
6	*Ipomia aquatica*	A	A	P
7	*Potamogeton pectinatus*	A	P	P
8	*Sagitaria latifolia*	A	A	P
9	*Parthenium hystrophorus*	A	A	P
10	*Phalaris arundinaceae*	A	A	P

P = Present

A = Absent

By scheming the frequency values of studied lakes it was evident that *Echhiornia crassipes, Elatina triandra* were the dominant species in laxmital in terms of frequency values of 0.78 and 0.53 respectively while *Ipomea aquatica and Potamogeton pectinatus* are dominant species in Barwasagr in terms of frequency values of 0.72 and 0.52 respectively Whilst *Eichhornia crassipes, Typha latifolia, Phalaris arundinacea, Amarunthus viridis* were dominant species in Atyatal, in terms of frequency values of 0.84, 0.52, 0.52,0.47 respectively. From Laxmital Lowest frequency values of 0.28 and 0.35 were obtained for the Species of *Amaranthus virdis and Potamogeton zostifornis*

respectively, From Barwasagar lowest frequency value of 0.1 was obtained for *Eichornia crassipes*. (Table.2).

Table 2. Macrophytic community features of frequency and abundance of three studied lakes

S.No.	Lake	Species Name	Frequency	Density	Abundance	I.V.I
1	**Laxmital**					
		Eichhornia crassipes	0.78	0.17	0.18	74.58
		Elatina triandra	0.53	0.17	0.21	67.58
		Typha latifolia	0.51	0.14	0.21	62.59
		Potamogeton zostiformis	0.35	0.14	0.19	53.93
		Amaranthus virdis	0.28	0.10	0.15	41.25
2.	**Burwasagar**					
		Ipomia aquatica	0.72	0.06	0.08	111.96
		Eichhornia crassipes	0.1	0.08	0.15	99.56
		Potamogeton pectinatus	0.52	0.05	0.07	88.44
3.	**Atyatal**					
		Eichhornia crassipes	0.84	0.47	0.75	51.94
		Sagitaria latifolia	0.36	0.42	0.72	37.09
		Potamogeton Pectinatus	0.26	0.47	0.75	36.64
		Typha latifolia	0.52	0.31	0.6	35.45
		Amaranthus viridis	0.47	0.31	0.46	31.35
		Elatina triandra	0.36	0.35	0.5	30.5
		Ipomia aquatic	0.15	0.47	0.56	29.95
		Phalaris arundinaceae	0.52	0.15	0.33	25.02
		Parthenium hystrophorus	0.31	0.21	0.36	21.96

From Atyatal lowest frequency values of 0.15, 0.26, and 0.31 were obtained for the species like *Ipomea aquatica, Potamogeton pactinatus, Parthenium hystrophorus* respectively. The maximum values for density, were recorded for *Eichhornia crassipes* (0.47), *Ipomea aquatica* (0.47) and *Potamogeton pectinatus* (0.47) all from Atyatal Whilst minimu values were recorded for *Potamogeton pectinatus* (0.05) from

Barwasagar. Floods and consequent silt deposition result in thy fast development of emergent communities (Pandit, 1992) The lakes depicted clear abundance of macrophytes; highest Abundance values of 0.75 were calculated each for *Eichhornia crassipes and Potamogeton pectinatus*, while lowest abundance values of 0.6 and 0.7 were observed for *Typha latifolia* and *Potamogeton pectinatus* respectively . In Atyatal higher values of IVI were recorded for *Echornia crassipes* (51.94), *Sagittaria latifolia* (37.09) and *Potamogeton pectinatus* (36.64); lowest values were recorded for *Parthenium hystrophorus* (21.96) and *Phalaris arundinaceae* (25.02). In Laxmital higher values of IVI were recorded for *Eichornia crassipes* (74.58) and *Elatina triandra* (67.58); lowest values were recorded for *Amaranthus virdis* (41.25) and *Potamogeton zostiformis* (53.93). In Barwasagar higher values of IVI were recorded for *Ipomea aquatica* (111.96) and *Eichornia crassipes* (99.56); lowest values were recorded for *Potamogeton pectinatus* (88.44). Total abundance values from the three studied lakes were compared with each other (Fig: 2).

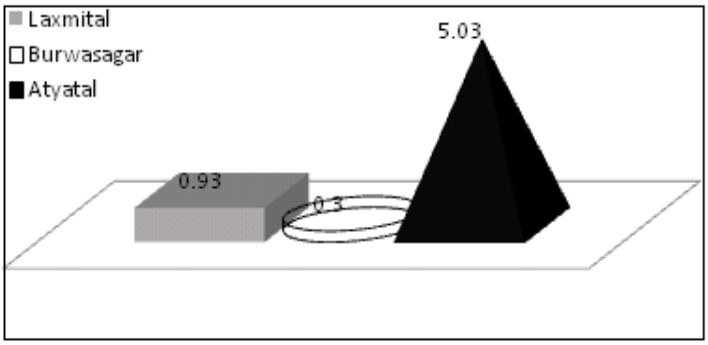

Fig:2. Total Abundance of three lakes

The study illustrated that all the three studied lakes were having greater coverage of emergent macrophytes, owing to change in water quality, water level fluctuation (Zutshi and Gopal,1990; Pandit, *et, al*., 2010;), shalowing of lakes by sedimentation (Pandit, 1992) and the presence of pollution in the form of solid waste through inlet tributaries/channels from adjacent areas and from agricultural fields. Nutrient enrichment of waters by domestic sewage or otherwise, cause drastic changes in the biomass of aquatic plants and later their species composition (Pandit, 2010; Phillips *et.*

al., 1978). Growth of emergent's becomes very dense with eutrophication (Moss, 1979) and with the increase in the alkalinity of lakes, the floating leaf species get replaced by emergent Macrophytes (Makela *et al*., 2004).The studied lakes are shallow lakes, which provide suitable habitat for the growth of emergent vegetations (Pandit, 2010). Emergents, the most productive communities of macrophytes (Westlake, 1963; Wetzel, 1973 and Koul *et al*, 1978), in the studied lakes indicated that the lakes are evolving at rapid pace, pointing towards increasing productivity of the lake ecosystems. The coverage/spread of macrophytes along the shore lines was higher compared to the center of the lakes where the species composition was found reduced.

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