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Study of medicinal importance of phytosociology of aquatic angiosperms (Macrophytes) in Govindgarh Lake, Rewa (M.P.)

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Abstract

Present investigations were carried out on the study of medicinal importance of Phytosociology of Aquatic angiosperms (Macrophytes) in Govindgarh Lake, Rewa (M.P.). The lake is narrow stripe with clear bluish water. In most parts, it is not deep and is with remarkable growth of macrophytes of rooted, emergent, floating and submerged types. It is also an excellent visit spots migratory birds during winter season. The paper reports about the distribution of macrophytes in the Govindgarh Lake with special reference to macrophyte composition, vegetation analysis along their phyto-sociological aspects. Not less than 19 species, 18 genera under 13 families can be recorded during the field study. The quantity and diversity of macrophytes are the important parameters for assessing the health of the ecosystem. Influx of tourists can be regulated in different study sites for managing the integrity of the ecosystem. Reduction in the growth of macrophytes can be minimized it will improve the health of the ecosystem.

Keywords: Phytosociology, aquatic, macrophytes, Govindgarh Lake

1. Introduction

Aquatic plants those who are photosynthetically active parts remain permanently or at least for several months in each year submerged in water or floating onto the water surface (Singh, 2006) ^[1]. Since the wetland is considered as a transitional area between land and water as a half-way world between terrestrial and aquatic ecosystems (Smith, 1980) ^[2]. In general, these represent plants which are found in and around the water bodies. Works on the floristic composition, ecology and distribution of hydrophytes in different parts of India were carried by several workers.

Aquatic plants (macrophytes) are of important component of lake because they provide food and habitat for invertebrates, fishes and wild life. The aquatic plant community or macrophytes comprises a diverse group of macrophyte organisms including angiosperms, ferns, mosses, liverworts, and some fresh water macro algae that occur in seasonally or permanently wet environment. Aquatic macrophytes can be used as tool in the determination of pollution and nutrient level. Submerged macrophytes play key role in the ecology of shallow, alkaline, clear water, lakes, where they form an extensive and diverse littoral community with numerous associated invertebrates, fish and birds (Jeppesen *et al.*, 1993) ^[3] while the cover and biomass of submerged macrophytes and their role in lake metabolism are largely predictable from lake area, basic configuration and nutrient loading (Gasith and Hoyer, 1998) ^[4].

The present investigation was, therefore, undertaken to study the species composition, vegetation analysis along their phyto-sociological aspects of different aquatic macrophytes in Govindgarh Lake.

2. Materials and Methods

The Govindgarh lake is one of the unique water body in India and located in south of Rewa, district in Madhya Pradesh at a distance of 20kms. from Rewa, with a longitude 24°20'25" and latitude 81°15'20". The lake is connected with all weather Rewa-Shahdol and Satna-Sidhi road. The lake was formed by impounding of small nalla originating from Kaimore hill. With a view to storing rain water, the Maharaja of Rewa at that time built a bandh across the Nalla to form a tank in the year 1958.

Monthly survey was done by quadrat method for collecting aquatic macrophytes in the tenure 2018-2020. The Macrophytes of the site have been identified with the help of permanent literature available on the taxonomy and were preserved in the Herbarium of Department of Botany, Govt. Science College, Rewa (M.P.). The distribution pattern of macrophytes from this site was studied for a period of Two years 2018-2020. All the macrophytes collected from this site were alphabetically arranged along with their family names according to Bentham and Hooker system of classification.

The plant species were identified with the help of standard literature (Sculthorpe, 1967; Jain and Rau, 1976; Khan and Halim, 1987; Cook, 1996; Gurung, 1991; Fassett, 1998; Gaur, 1999; Press, *et al.* 2000; Munshi & Roy, 2010) [5-14] and visual inspection by plant taxonomists Importance Value Index (IVI) was calculated by totaling the relative

values of density, frequency and cover (by visual estimation).

3. Results and Discussion

A total of 19 species of macrophytes belonging to 18 genera and 13 families were recorded from the littoral zone of the Govindgarh Lake (Table 1). These aquatic macrophytes are used by local people as medicinal purposes. Maximum number of species belonged to emergent (11 species) followed by submerged (4 species), Marginal (2 species) and Rooted-floating leaf type (2 species) macrophytes. The Asteraceae, Lemnaceae family emergent and Hydrocharitaceae family submerged was found to be highly dominant macrophytes. Macrophytes dwelling the littoral zone of Govindgarh Lake and their common name, category of medicinal uses, have been presented in (Table 1).

Table 1: Aquatic macrophytes (category, common name, family and medicinal uses) dwelling littoral zone of the Govindgarh Lake

Category of macrophytes	Family	Species	Common names	Medicinal uses
Emergents	Amaranthaceae	<i>Aerva lanata</i> L.	Chhaya, Gorakhbuti	Used as vermifuge, Diuretic and lithontriptic.
	Araceae	<i>Pistia stratiotes</i> L.	Jalkhumbhi	Part of concoction to treat flu. Regular use of half cup of decoction of root is administered in eczema, cold and cough.
	Asteraceae	<i>Bidens Pilosa</i> L.	spanish needle, Kumra, Kumur, Kurei	A juice made from the leaves is used to dress wounds and ulcers.
		<i>Bidens cernua</i> L.	Nodding bur - marigold (sunflower)	Medicinal herb, folk medicine
	Lemnaceae	<i>Lemna trisulca</i> L.	Duckweed	The treatment of swellings.
		<i>Spirodela polyrhiza</i> L.	Duckweed	The whole plant is antipruritic, antipyretic, cardiotoxic, carminative, diaphoretic, diuretic.
	Menyanthaceae	<i>Nymphoides cristata</i> (Roxb.) Kuntze.	Jalrani/ Kumudini	The treatment of fever and jaundice
	Nymphaeaceae	<i>Nelumbo nucifera</i> Gaertn.	Kamal	One table spoon of decoction of flower mixed with a glass of water in regularly used as cardio tonic and liver tonic. Powdered rhizome is used externally to cure piles.
		<i>Nymphaea nouchali</i> Burm.f.	Neelkamal	It was mainly used to treat indigestion. The rhizome is considered demulcent and used for dysentery and dyspepsia.
Poaceae	<i>Saccharum bengalense</i> Retz.	Sarkanda, Moonj, Kans	According to Ayurveda, roots are sweet, astringent, emollient, refrigerant, diuretic, lithotriptic, purgative, tonic, aphrodisiac and useful in treatment of dyspepsia, burning sensation, piles, sexual weakness, gynecological troubles, respiratory troubles etc.	
	Ranunculaceae	<i>Ranunculus letus</i> L.	Leaved buttercup	Plant juice antibacterial, febrifuge, antifungal and antimalarial, used in intermittent fevers, gout and asthma. Paste made from the leaves used for gas troubles and joint pains.
Rooted floating - leaf type	Apiaceae	<i>Centella asiatica</i> L.	Gotu Kola, Brahmi	Used as antibacterial, anti-inflammatory, antifebrile.
	Poaceae	<i>Vetivaria zizanioides</i> (L.) Nash	Khus khus	It is used to treat many skin disorders and is known to have calming effect on the nervous system.
Submerged	Amaranthaceae	<i>Alternanthera sessilis</i> L.	Gudrisag,	Edible "sakh" and used in febrifuge, Diarrhoea
	Ceratophyllaceae	<i>Ceratophyllum demersum</i> L.	Khaja chhoti	Paste of leaf is externally applied in cases of scorpion. Decoction of leaf is used for 10 to 15 days to regulate biles secretion.
	Hydrocharitaceae	<i>Hydrilla verticillata</i> (L.f.) Royle	Sewar or Khaja motipatti Jhangi, Kurel	Decoction of leaf is used in the treatment of abscesses boil and wounds. Leaves are dried powdered and applied on cuts and wounds.
<i>Vallisneria spiralis</i> L.		Feeta ghas	The plant is aperitif, demulcent, refrigerant, stomachic and is also used in the treatment of women's complaints.	
Marginal	Convolvulaceae	<i>Ipomoea carnea</i> Jacq.	Beshram	Livestock fodder, part of concoction to wash new baby. Decoction of leaf is used as blood purifier.
	Marsileaceae	<i>Marsilea quadrifolia</i> L.	Chopatiya	Juice of leaf is taken four times a day in diarrhea

The quantitative seasonal analysis macrophytic composition of the provide baseline information for formulating conservation Govindgarh lake. The quantity and diversity of macrophytes are the important parameters for assessing the health of the ecosystem. Influx of tourists can be regulated in different study sites for managing the integrity of the ecosystem. Reduction in the growth of macrophytes can be minimized it will improve the health of the ecosystem.

Quantitative analysis of freshwater macrophytes: The emergent macrophytes grow intensively in the littoral zone

up to depth of 0.10-0.30m except in the zones of flowing water (close to the outlet). The second layer is formed by the rooted floating – leaf type upto a depth of 0.30-0.50 m. The number of aquatic macrophyte species were higher during S1 (19) and S2 (17) and S3 (17) sites (Table 2). The percentage composition of different forms of macrophytes is presented in (Figure 1). Emergent species contributed (53.22%) to the total macrophytes, followed by submerged (25.89%), Rooted - floating leaf type (10.33%) and Marginal species (10.56%).

Table 2: Analysis in important value index (IVI) of different growth forms of macrophytes of Govindgarh Lake

Species, categorized by growth form	Importance value index (IVI) in			
	S1	S2	S3	Average
Emergent				
<i>Aerva lanata</i> L.	9.41	8.81	7.23	8.48
<i>Pistia stratiotes</i> L.	9.58	1.01	8.66	6.42
<i>Bidens Pilosa</i> L.	7.39	0.77	6.39	4.85
<i>Bidens cernua</i> L.	8.71	8.68	5.12	7.50
<i>Lemna trisulca</i> L.	6.72	9.54	9.62	8.63
<i>Spirodela polyrhiza</i> L.	7.38	9.72	8.46	8.52
<i>Nymphoides cristata</i> (Roxb.) Kuntze.	7.12	9.15	0	5.42
<i>Nelumbo nucifera</i> Gaertn.	5.88	9.67	0	5.18
<i>Nymphaea nouchali</i> Burm.f.	6.22	0	10.89	5.70
<i>Saccharum bengalense</i> Retz.	6.11	9.06	8.46	7.88
<i>Ranunculus letus</i> L.	5.71	8.63	7.29	7.21
Total	80.23	75.04	72.12	75.79
Percentage (%)	57.58	51.68	50.53	53.22
Rooted Floating – Leaf Type				
<i>Centella asiatica</i> L.	7.99	0	9.62	5.87
<i>Vetivaria. zizanioides</i> (L.) Nash	6.14	11.21	9.18	8.84
Total	14.13	11.21	18.8	14.71
Percentage (%)	10.14	7.72	13.17	10.33
Submerged				
<i>Alternanthera sessilis</i> L.	9.61	12.72	11.14	11.16
<i>Ceratophyllum demersum</i> L.	7.77	6.56	7.79	7.37
<i>Hydrilla verticillata</i> (L.f.) Royle	8.22	12.05	10.39	10.22
<i>Vallisneria spiralis</i> L.	7.11	9.77	7.48	8.12
Total	32.71	41.1	36.8	36.87
Percentage (%)	23.48	28.31	25.78	25.89
Marginal				
<i>Ipomoea carnea</i> Jacq.	5.08	6.93	8.36	6.79
<i>Marsilea quadrifolia</i> L.	7.18	10.91	6.66	8.25
Total	12.26	17.84	15.02	15.04
Percentage (%)	8.80	12.29	10.52	10.56
Grand Total	294.34	286.93	295.78	292.35

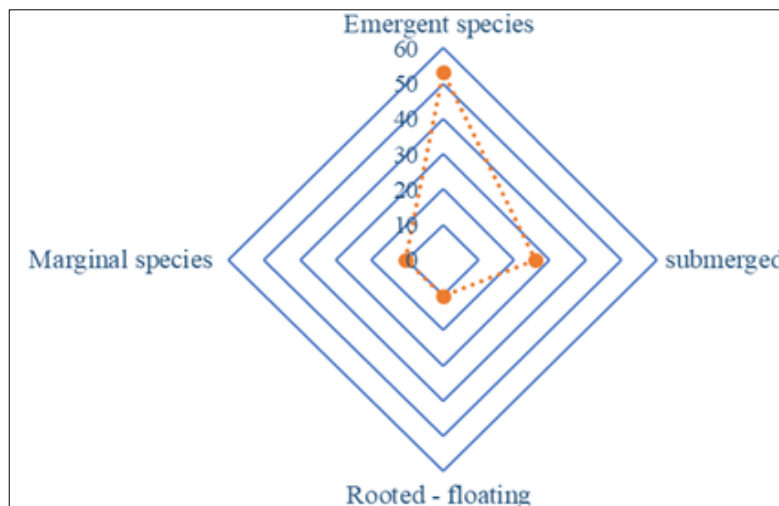


Fig 1: Percentage composition of different growth forms of macrophytes of Govindgarh Lake

The dominance of species by growth forms on the basis of IVI value is presented in (Table 2). Emergents were the most dominant form throughout the year. The emergent macrophytes grow intensively in the littoral zone except near the outlet region. IVI of emergent macrophytes was highest in the sites S1, followed by S2 and S3. Among emergents, *Pistia stratiotes* L., *Spirodela polyrhiza* L. and *Nymphaea nouchali* Burm. f. were the most dominant in the S1 and S2, and S3 sites. After emergents, the next highest IVI values were those of submerged species in the *Alternanthera sessilis* L., S1, S2 and S3, followed by rooted floating - leaf type species in the S1 and S3 *Centella asiatica* L. and *Vetivaria. zizanioides* (L.) Nash study site S3. Among the submerged species, *Alternanthera sessilis* L. was highly dominant throughout the year. The highest IVI values for this species were found in the Study site S2(12.72), followed by the S3 (11.16) and S1 (9.61). Among the submerged species, *Alternanthera sessilis* L. was highly dominant. Consequently, the lowest IVI value for *Ipomoea carnea* Jacq. S1, was observed during the *Pistia stratiotes* L. S2 and *Bidens Pilosa* L. S3. Annual average IVI values of emergent's were found to be dominant (75.79), followed by the submerged (36.87), rooted floating-leaved species (14.71) and Marginal (15.04) macrophytes. Sediment slope and texture also influence growth, distribution and occurrence of the macrophytes species in a particular water body (Pearshall, 1920, Spence, 1967, Keddy, 2000, Shrivastava, 2010, Patel and Dubey, 2020) [15-19].

4. Conclusion

The dominance of emergents among other growth forms (as shown by IVI dimensions) indicates the disturbance caused by the various anthropogenic activities of the tourists in the riparian zone of the wetland. Based on the above results, it can be concluded that the high altitude wetland, Govindgarh Lake, showed high diversity of macrophytes during sites S1-S3.

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