



Diversity of aquatic macrophytes of Bathi lake, Davanagere, Karnataka

Veeranna B Shettar

Department of Botany, Srisaila Jagadguru Vageesha Panditaradhya College Harihar, Davangere, Karnataka, India

Abstract

Aquatic macrophytes comprises a diverse group of organisms including angiosperms, ferns, mosses, liverworts and some macro algae that occur in seasonally or permanently wet environments. Among other implications, aquatic macrophytes are highly productive and with an important structuring role on aquatic environments. Ecological studies involving aquatic plants substantially increased in the last years. However, a precise view of researches devoted to aquatic macrophytes in Bathi Lake is necessary to reach a reliable evaluation of the scientific production. In the current study, we collected and identified aquatic Macrophytes of Bathi Lake. In addition, researches aiming to describe unknown species are still necessary. This is essential to support conservation efforts and to subsidize further investigation.

Keywords: Diversity, aquatic macrophytes, Bathi lake

Introduction

Aquatic Plants like macrophytes are grow in water shade areas. Macrophytes shows great deal of Variety therefore they have been grouped into three general categories submerged: plants that primarily grow completely below the water surface; emergent: plants that are rooted in the sediments and protrude up at the water surface; floating: plants that can be rooted to the bottom but have leaves floating on the water surface or plant may be completely free floating. On an account the species diversity is the number different species that are represented by a collection. The plenty of native plants communities habitually sustain an equilibrium within the biosphere to reassure their own favorable outcome in conjunction with other species at varying tropic levels (Ahmad & Parveen, 2013).

Aquatic Macrophytes are large and lavish to see with the naked eye that grow permanently or periodically submerged below, floating on or growing up through the water surface and they are basically photosynthetic in nature. Generally it encompass aquatic bryophytes, pteridophytes and angiosperms (Cook 1996, Chambers *et al.* 2008). Water is an element of existence on the earth that absolutely monopolize the chemical configuration of all organisms (Wetzel, 2001). Fresh water is essential for human growth and development. It is a finite resource of earth. Rapid growth of urban areas directly or indirectly affected existence of the pond such as over exploitation of resources and improper waste disposal practice (Thilaga *et al.*, 2005). Limnology plays a very important role in the decision making process in aquaculture practices. A substitute in water quality influence on the biotic community effects rate of producer level in aquatic ecosystem (Iwama *et al.*, 2000). Limnology deal with the study of fresh waters contained within continental boundaries. Limnology evolved into a distinct science only in the past century, integrating physical, chemical and biological disciplines to become able to describe and manage freshwaters ecosystems. Although inland water bodies are well below the oceans size, they are complex systems and they can't be fully understood if studied without taking into account the complex interrelations between physical, chemical and biological

aspects this paper offers an overview of the basic principles of limnology. Particular attention has been devoted to the integration of physical, chemical and biological information, highlighting how abiotic and biotic compartments deeply interacts to determine lakes and rivers evolution. Thus this text has the ambition to improve the mutual understanding between the different disciplines dealing with the specific compartments of freshwater ecosystems. Phytochemicals are non-nutritive plant chemicals that have protective or disease preventive properties. They are non-essential nutrients, meaning that they are not required by the human body for sustaining life, its well-known that plant produce these chemicals to protect themselves but recent research demonstrate that they can also protect humans against diseases. These phytochemical compounds are classified into primary and secondary metabolites. A primary metabolite is directly involved in normal growth development and reproduction (Ex: amino acids, carbohydrates, lipids, proteins, lectins etc.) secondary metabolite is a generic term used for more than 30,000 different substances which are exclusively produced by plants. The secondary metabolites such as alkaloids, steroids, phenolics etc. are not universal in occurrence but play key role in ecophysiology of plants. Accordingly these have a defensive role against harmful organisms. Hence secondary metabolites are gaining importance in the field of medicinal plant. Research owing to their therapeutic properties. Among the approximately 5, 00,000 to 7, 50,000 existing plant species. The known species are only around 2, 50,000 out of which between 50,000 and 80,000 flowering plants are used medicinally (IUCN Species Survival Commission, 2007). In Ayurveda more than 2000 plants are find in regular use among them only 600 species are most commonly exploited by the traditional practitioners in the formulations of drugs. From these medicinal plants 12,000 different secondary metabolites have been isolated, a number estimated to be less than 10% of the total (Schulter *et al.*, 1978). Antimicrobial is a substance that kills or inhibits the growth of microorganisms such as bacteria, fungi, protozoans and viruses. Although hundreds of plant species have been tested for antimicrobial properties. The vast majority of have not been adequately evaluated.

Considering the vast potentiality of plants as sources for antimicrobial drugs with references to antibacterial and antifungal agents, a systematic investigation was undertaken to screen the various medicinal plants for antimicrobial activity (Mahesh et. al., 2008).

Study area and location

This sample site located 14°28' 23' ' North latitude, 75°52' 13' ' E longitude. Geographically it lay in Davanagere taluk.



Fig 1: Bathi Lake GPS Map

Materials and Methods

The study area was explored thoroughly and detailed observation on the vegetation. Macrophytes were collected and preserved according to herbarium techniques. Collected material were identified with the help of standard literatures and confirmed in the herbarium of Botanical Survey of India.

Results and Discussion

In the present investigation, Bathi Lake was selected as Site 01 which is located in Davanagere taluk. This sample site located 14°28' 23' ' North latitude, 75°52' 13' ' E longitude. And it spread in 26.3 hectares with catchment area mingle with paddy fields and variety of submerged, rooted, floating macrophytes and a road passes along the bank of lake which connect the Harihar and Davanagere town. The dangerous agricultural waste and effluents which were discharged from the KMF dairy, which is situated beside the lake.

In the present investigation of Site 01, the frequent visit were made and recorded 07 species by quadrat method to know the Density, Abundance, Frequency and Species Importance Value. The list of Aquatic macrophytes are furnished below Table 1.

Table 1: List of aquatic macrophytes in site 01

Sl.No.	Species Name	Family
01	<i>Pistia stratiotes</i>	Araceae
02	<i>Eichhornia crassipes</i>	Pontederiaceae
03	<i>Vallisneria spiralis</i>	Hydrocharitaceae
04	<i>Lemna minor</i>	Lemnaceae
05	<i>Jussiaea repens</i>	Onagraceae
06	<i>Ipomoea aquatic</i>	Convolvulaceae
07	<i>Polygonum glabrum</i>	Polygonaceae

And it spread in 26.3 hectares with catchment area mingle with paddy fields and variety of submerged, rooted, floating macrophytes and a road passes along the bank of lake which connect the Harihar and Davanagere town. The water source mainly by rain fall only. Mainly helps in irrigation, duping of Ganesha idols and a paradise of many aquatic birds such as native and exotic birds it is a perennial lake. (Fig. 02) (Site – 01: Bathi Lake)

Aquatic plants serve as good source of food to mankind and animals thus forming a palatable food for water birds and a best for aquatic wild life conservation practices. Aquatic vesicular plants are important indicators of water pollution. Many workers contributed recent aspects of production studies of macrophytes. But, comparatively, the productivity studies of macrophytes in the ponds situated near the industries are less. The sub merged aquatic macrophytes are important constituents of water body which take up elements by well-developed root or rhizome. Aquatic plants are important as they supply food and shelter for many aquatic organisms. They serve as substratum to different micro and macro organisms. According to Kudryavtsev and Yeshov dead parts of the macrophytes act as excellent substrate for the development of micro-organisms.

Table 2: Seasonal Variations of aquatic macrophytes density in site 01

Sl. No	Species Name	Density (D)		
		Summer	Rainy	Winter
01	<i>Pistia stratiotes</i>	3.5	2.4	5
02	<i>Eichhornia crassipes</i>	19.5	15.5	22.50
03	<i>Vallisneria spiralis</i>	1.90	1.20	2.50
04	<i>Lemna minor</i>	4.75	3.25	6.25
05	<i>Jussiaea repens</i>	2.9	1.6	3.12
06	<i>Ipomoea aquatic</i>	7	4	10
07	<i>Polygonum glabrum</i>	9.25	7.75	11.25

The density of Site 01 represents that, a total of 07 aquatic macrophytes belonging to 07 families were found in the lake, out of total 07 species recorded Pontederiaceae family has shown the presence of maximum number of species i.e. *Eichhornia crassipes* contributing to 55-58%. Other families like Araceae, Hydrocharitaceae, Lemnaceae, Onagraceae, Convolvulaceae and Polygonaceae had one species each

contributing to 4.5- 5%. The maximum value of density was shown by *Eichhornia crassipes* with values ranging from D =15.5 to D = 22.50 respective seasons like rainy, winter and summer followed by other species respectively.

Table 3: Seasonal Variations of aquatic macrophytes Abundance

Sl.No.	Species Name	Abundance (A)		
		Summer	Rainy	Winter
01	<i>Pistia stratiotes</i>	4.10	3.13	5.71
02	<i>Eichhornia crassipes</i>	20.50	16.5	22.50
03	<i>Vallisneria spiralis</i>	2.30	1.10	3.33
04	<i>Lemna minor</i>	9.50	7.50	12.50
05	<i>Jussiaea repens</i>	6.45	5.90	8.33
06	<i>Ipomoea aquatic</i>	9.50	7.50	11.40
07	<i>Polygonum glabrum</i>	9.75	7.25	12.85

The abundance of Site 01 represents that, a total of 07 aquatic macrophytes belonging to 07 families were found in the lake, out of total 07 species recorded Pontederiaceae family has shown the presence of maximum number of species i.e. *Eichhornia crassipes* contributing the maximum value of abundance was shown by *Eichhornia crassipes* with values ranging from A =16.5 to A = 22.50 respective seasons like rainy, winter and summer followed by other species respectively.

Table 4: Seasonal Variations of aquatic macrophytes Frequency

Sl.No.	Species Name	Frequency (F)		
		Summer	Rainy	Winter
01	<i>Pistia stratiotes</i>	0.68	0.55	0.87
02	<i>Eichhornia crassipes</i>	0.85	0.75	1
03	<i>Vallisneria spiralis</i>	0.65	0.60	0.75
04	<i>Lemna minor</i>	0.4	0.3	0.5
05	<i>Jussiaea repens</i>	0.26	0.21	0.37
06	<i>Ipomoea aquatic</i>	0.68	0.55	0.87
07	<i>Polygonum glabrum</i>	0.68	0.55	0.87

The frequency of Site 01 represents that, a total of 07 aquatic macrophytes belonging to 07 families were found in the lake, out of total 07 species recorded Pontederiaceae family has shown the presence of maximum number of species, the maximum value of frequency was shown by *Eichhornia crassipes* with values ranging from F =0.75 to F = 1.0 respective seasons like rainy, winter and summer followed by *Pistia stratiotes* (F=0.55 to F=0.87), *Ipomoea aquatica* (F=0.55 to F=0.87), *Polygonum glabrum* (F=0.55 to F=0.87) and other species and seasons respectively.

Table 5: Seasonal Variations of aquatic macrophytes Species Importance Value

Sl.No.	Species Name	Species Importance Value (SIV)		
		Summer	Rainy	Winter
01	<i>Pistia stratiotes</i>	18.15	16.25	22.10
02	<i>Eichhornia crassipes</i>	13.45	11.55	16.39
03	<i>Vallisneria spiralis</i>	14.40	12.50	16.17
04	<i>Lemna minor</i>	15.75	13.25	17.89
05	<i>Jussiaea repens</i>	4.02	3.06	6.06
06	<i>Ipomoea aquatic</i>	25.48	22.56	29.79
07	<i>Polygonum glabrum</i>	28.56	26.55	31.81

The Species importance Value of Site 01 represents that, In the total of 07 aquatic macrophytes belonging to 07 families were found in the lake, out of total 07 species recorded Polygonaceae family has shown the presence of maximum

number of species, the maximum value of Species importance Value was shown by *Polygonum glabrum* with values ranging from SIV =26.55 to SIV = 31.81 respective seasons like rainy, winter and summer followed by other species and seasons respectively.

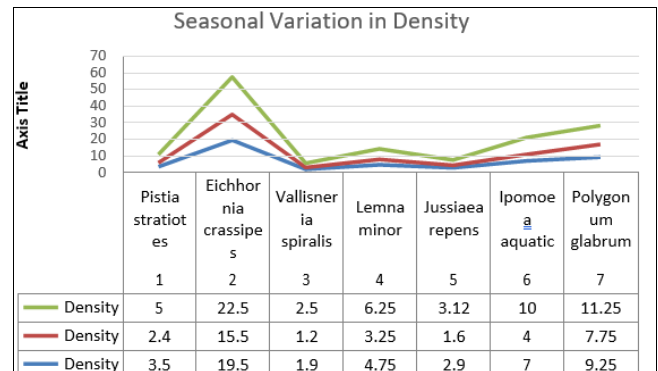


Fig 1: Seasonal Variations of aquatic macrophytes density

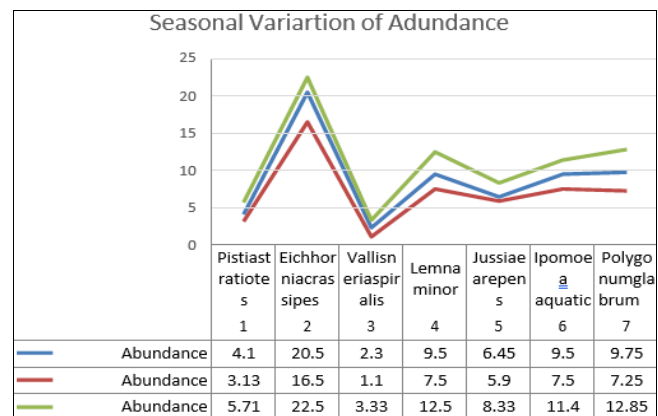


Fig 2: Seasonal Variations of aquatic macrophytes abundance

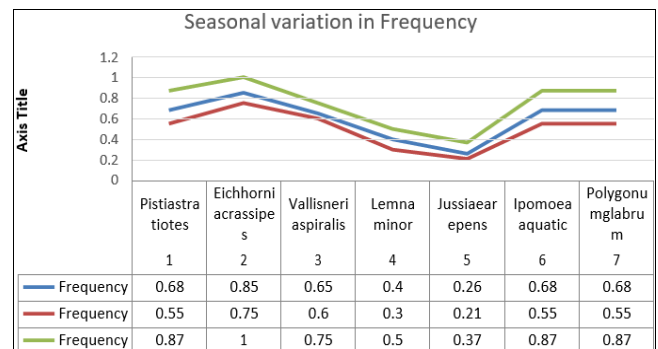


Fig 3: Seasonal Variations of aquatic macrophytes Frequency

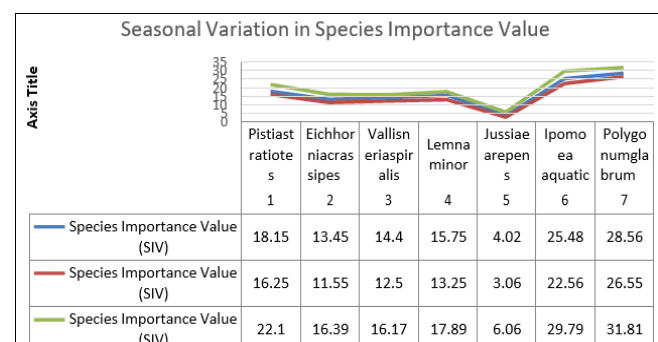


Fig 4: Seasonal Variations of aquatic macrophytes Species Importance Value

References

1. Oyedeyi AA, Abowei JFN. The classification, distribution, control and economic importance of aquatic plants. *International Journal of Fisheries and Aquatic Sciences*,2012:1(2):118-128.
2. Lacoul P, Freedman B. Environmental influences on aquatic plants in freshwater ecosystems. *Environ. Rev*,2006:14:(2):89-136.
3. MAY RM. The scientific wealth of nations. *Science*,1997:275(5301):793-796.
4. Pace ML. Prediction and aquatic sciences. *Can. j. aquat. sci.*,2001:58(1):63-72.
5. Piedade Mtf, Junk WJ, Long SP. The productivity of the C4 grass *Eichinocloa polystachya* on the Amazon floodplain. *Ecology*,1991:72(4):1456-1463.
6. World Bank. 2007 World Development Indicators database. Available from: [10. 08. 2007], 2007.
7. Sculthorpe CD. The biology of aquatic vascular plants. Königstein- West Germany: Koeltz Scientific Books, 1985, 597.
8. Alling Jf, Lemoalle J. *Ecological Dynamics of Tropical Inland Waters*. Cambridge: Cambridge University Press, 1998, 441.
9. Anene A. *Techniques in Hydrobiology*. In: Eugene, N.O. and O.O. Julian (Eds.), *Research Techniques in Biological and Chemical Sciences*. Springfield Publishers, 2003, 174-189.
10. Clean Water Team (CWT). Dissolved Oxygen fact sheet, FS- 3.1.1.0 (DO). in: *The clean water team guidance compendium for watershed monitoring and assessment, version 2.0*. Division of water quality, California State Water Resource Countrol Board (SWRCB). Sacramento, CA, 2004, 5.
11. Keddy PA. *Wetland Ecology: Principles and conservation* (2nd edition). Cambridge University Press, Cambridge, U. K, 2010, 497.
12. Sculthorpe CD. The biology of aquatic vascular plants. Königstein- West Germany: Koeltz Scientific Books, 1985, 597.
13. Emmanuel BE, Onyema IC. The plankton and fishes of a tropical South Western Nigeria. *Turkish Journal of Fisheries and Aquaculture Science*,2007:7:105-113.