Journal of Experimental Sciences Vol. 1, Issue 5, Pages 01-03 [2010]
www.jexpsciences.com

Regular Article

Phytosociological Study of Macrophytes in a Polluted Pond of Shahjahanpur (India)

Saltanat Ara Malik and Atul Namdeo*

Department of Botany, Khusro Memo. Degree College, Bareilly, (U.P.) India

Abstract

A phytosociological Study of Macrophytes was conducted in the present investigation in a Polluted Pond of Shahjahanpur area in India.

Introduction

Fresh water bodies all over the world irrespective of their varied abiotic conditions, often serve as suitable environment for the colonization of different types of aquatic macrophytes with great ecological importance. Pearsall (1917) was the Pioneer researcher who has shown the existence of dynamic relationship between the aquatic communities and their environmental conditions. Unni (1972), Sharma and Singhal (1988) have studied the importance of abiotic factors in the growth behaviour and distributional pattern of aquatic plants. Bachmann (1990), Simola *et. al* (1990) and many others worked on lentic environment outside of India while Yadava *et. al.* (1987), Kumar and Rana (1989) made similar efforts in India. According to Granberg (1973) and Nageshwar Rao & Balasubramanyam (1993) the domestic wastes released from the houses disturb the natural composition of the pond ecosystem.

The small scale industries also use this water body as dumping ground for the domestic and Industrial wastes. That on the other hand, poses a serious threat to existence and the conversation of respective flora and fauna. Thus, other authors in the present work have made attempt to give a comprehensive account of the phytosocialogy of macrophytic communities with a aim to formulate some conservation measures to mitigate the problem of cultural eutrophication.

Material and Method

Site description

In the present communication a permanent Lodhipur pond has been selected which is situated at the east corner of Shahjahanpur city. Shahjahanpur city is situated in tarai belt of upper Gangetic plain (Uttar Pradesh) at 27.5^0 5/N[1] Latitude and 79^0 55E Longitude. Lodhipur pond receives water from Khannaut river and water is stored after the flood. A few narrow water drainages also joint with the pond and waste water from the homes of Indira Nagar Colony, Lodhipur colony as well as NTI colony flow and fall in the pond. In addition of dairy washes and agricultural discharges are carried by water to the pond. The pond is 340 meter in length and 120 meter breath. While the depth various at different but 12 meter in the centre.

Sampling and analysing of water

The sample of the water collected for chemical analysis at 16^{th} day of each month. Between 10 A.M. to 12 Noon for one year. The transparency of water was measured through "Sacchi disc". The temperature was recorded at the depth of 5 cm and pH was also measured. The chemical factors were analysed according to standard method of APHA (14^{th} edition, 1975).

Phytosociological

For phytosociological analysis of the macrophytes, ten quadrats (50 X 50c.m.) were laid down at random at different places in the pond. The number of individuals and percentage cover value for each plant species were recorded (Mishra, 1968). The vegetation data were qualitatively analysed for abundance, density and frequency (Curtis & Milintosh 1950, 1950) The importance value index (IVI) was determined by calculating the basal area of species (Hanson & Churchill, 1961)

Results and Discussion

In the present investigation 21 macrophytes have been reported from the study site. Table 1.2. There are 2 species of Pteridophytes, 14 monocots and 5 are dicots. They belong to 17 families. The monocoty ledonous species are found to be more than the dicots and pteridophytes. The dominant family in the present context are found to be Cyperaceae (3 species), Lamnaceae (3 species) and rest families have a single species.

The macrophytes can be grouped in to 7 groups followed by Baruah & Baruah (2000) and Sharma and Dhakre (1993) on the basis of their location in the water bodies. Emergent amphibious hydrophytes (EAH) with species were dominant forming the dominant ecological categories followed by free floating Hydrophytes (FFH). Due to range tolerance and adaptability certain macrophytes can thrive in two or more habitat condition in relation to substratum & transit from one growth form to other (Islaam, 1999). *Eichhornia crassipes Ipomoea aquatica, Sagittaria sagittifolia, Polygonum limbatum, Echinochloa colonum, Scripus articulatus* and *Marsilea minima* can exit both in aquatic and amphibious conditions.

Flowering & fruiting behaviour of mocrophyts were found variable throughout the season which confirms to the result of Islaam (1999). Who also worked on a few lentic habitats of upper Assam and Sharma & Dhakre (1993) of Shahjahanpur district. Majority of plants bloom in during winter months and flowering continues up to dry months. Regular fluctuation of water label due to rains and flood create marshy conditions on the bank of pond which encouraged the amphibious plant groups to grow. During winter the domestic animals disturbed the vegetation of the pond. Thus the free floating plants and amphibious plants decrease in the population.

The plant show phytosociological variation depending upon the months. *Azolla pinnata* shows the maximum density in August while maximum in the month of December. It is followed by *Eichhornia crassipes* and *Spirodela polyrhiza, Typha angustata* shows the maximum abundance in the month of July and minimum in the month of April. It is followed by *Lemna pausicostata* and *Hydrilla verticillata. Eichhornia crassipes* shows the maximum frequency in the month of October and becomes minimum in the month of March. It is followed by *Cyprus exalatus* and *Ceratophyllum demersum.*

According to IVI values *Sagittaria sagittifolia* emerges as dominant owing to its higher relative density, relative frequency and relative dominance value. Ipomoea aquatica (124.67), *Polygonum limbatum* (106.68) and *Typha angustata* (72.35) are the co-dominant species. The seasonal changes in the structures of mcarophytes are due to change of water regime, temperature and pollutants (Table 1.1). During monsoon when the ponds and rivers get inundated with water. Macrophytes such as *Azolla pinnata, Ceratophyllum demersum, Carex fedia, Cyperus exalatus, Eichhornia crassipes, Hydrilla verticillata* are emerged out in the pond.

* Corresponding Author, Email: namdeo66@gmail.com

Table – 1.1 - Physicochemical attributes of water in Lodhipur pond

Parameters	Temperature
Temp (^{0}C)	18.87 – 28.0
Clour	Turbid, Palegreen-muddy.
Odour	Odourless.
Transparency (cm)	3.25-6.2
Redox Potential (mγ)	15.44-16.34
Alkalinity (PPm)	168-231
Conductivity (mho/cm)	32.1 39.05
pH	8.0 – 9.0
BOD (ppm)	12.0 – 1381
DO (ppm)	5.2 – 8.5
TDS (ppm)	1160-1218
Ca (ppm)	16.34-21.09
Mg (PPm)	0.23 – 0.32
Na (PPm)	150.0 – 189
Free Co_2	164.0 – 198.02
Cl (PPm)	62.0 – 75.3
SO_4 (PPm)	8.3 – 9.6
NO_2 (PPm)	0.29 – 0.46
NO_3 (PPm)	0.17 – 0.38
Mn (PPm)	0.01- 0.06
PO_4 (PPm)	0.13 – 0.21
Fe (PPm)	0.24 – 0.31

Table 1.2-Flowering, Fruiting and spore formation season

Name of the plant	Family	Reproductive Phytophases	Habit	Dansity	Abunda-nce	Freque-ncy	Freq. Class	IVI
Azolla pinnata R.Br.	Azollacea	Nov. – Feb.	FFH	13.0	16.25	100	E	2.87
Carex fedia Nees	Cyperaceale	Oct.- Mar.	WLH	8.0	14.28	100	E	2.70
Ceratophyllum demer sum L	Cyratophyllaceae	Sep – Nov.	SH	12.5	16.0	60	C	24.24
Cyperus exalatus Retz.	Ceratophyllaceae	Mar – Nov.	WLH	12.5	15.0	80	C	5.49
Eichhornia carassipes (Mar.) Solms	Pantaderiaceae	Feb. – Dec.	FFH	13.0	14.16	100	E	103.90
Echinochloa colonum L.	Poaceal	Aug-Mar.	WLH	9.0	13.6	90	E	12.53
Erioeaulon cinerum R.Br.	Eriocauelaceae	Sep. – March.	EAH	8.0	16.25	80	C	3.68
Hydrilla verticillata (L.F.) Royle	Hydraocha ritaceae	Oct.- Mar.	SAH	12.0	40.0	100	E	14.00
Hydrolea zeylanica (L) Vahl.	Hydrophyllaceae	Sep. Apr.	EAH	7.5	16.66	60	C	8.85
Ipomoea aquatic Forsk	Convolvulaceae	Sep. – Feb.	EAH	8.5	15.0	70	D	124.67
Lemna paucicostata Hegelm	Lemnaceae	May – July	FFH	12.0	62.5	70	D	2.70
Ludwigia perennis L.	Onagraceae	Mar. – Nov.	SFA	8.0	16.25	100	E	9.72
Marsilea minima L.F.	Marsiliaceae	Nov. Jan.	EAH	13.0	14.28	100	D	46.97
Nyphaea nouchali Burm. f.	Nympheaceae	July- Dec.	EAH	7.0	12.5	60	C	11.82
Polygonum limbatom Meissn	Polygonaceae	Oct. – Mar.	EAH	8.0	16.0	80	C	106.68
Sagittaria sagittifolia L.	Alismata Ceae	Nov. – March	EAH	12.0	20.0	100	E	131.68
Scirpus articulates L.	Cyperaceae	Oct. – Mar.	EAH	6.0	12.5	40	B	13.49
Spirodela polyrhiza (L.) Schlied	Lamnaceae	Feb. – Aug.	FFH	13.0	16.0	100	E	2.91
Typha angustata Bory & Chaub	Typhaceae	Nov. – March	WLH	12.5	88.0	90	E	72.35
Wolffia arrhiza (L.) Winmer	Lemnaceae	Nov. – Aug.	FFH	7.7	16.25	70	D	3.19
Zannichellia palustries L.SSp pedicellata whalen & rosen	Zarnnidelliaceae	Oct. – May	SAH	12.5	12.5	80	C	3.53

FF = Free floating FS = Free Submerged SA = Anchored Submerged
FA = Anchored floating EA = Emergent Amphibious MA = Marshy Amphibious

Physicochemical attributes of Lodhipur pond suggests that physical and chemical characteristics are related to their periodic changes and interdependent. During the present study it was observed that the periods of high temperature considered with those of low oxygen content (Table 1.1). It is conform with the observations of Pearsall (1932), Rao (1955), Viyas and Kumar (1968). The oxygen content of water showed almost inverse co-relation with free CO_2 (Table 1.1). A feature observed by Lakshminarayana (1965).

The water of Lodhipur pond was always alkaline and changes in pH are small and gradual accepter for the month of October when there was a sudden fall probability due floods constant water movement and spars? macrophyte. Blum (1956) Lakshminarayana (1965) While

co-relating pH and macrophytes density started that water maintained relatively high pH values when vegetation was generally rich and well developed. A direct co-relation between pH and macrophytic vegetation was observed during the present studies. The maximum values for nitrate and phosphate seem due to runoff water, polluted by sewage and natural drainage as the source of ions. The chemical composition of Lodhipur pond favoured the development of large number of macrophytes as well as their profuse growth. In Lodhipur pond higher transparency (Table 1.1) favors the high density of submerged species and when water becomes turbid floating species dominate. This observation is in the support of Zutshi and Vass (1975). It seems that the dominant species *Ipomoea aquatica, Polygonum limbatum* and *Typha angustata* may be due to eutrophication (Table 1.2).

The overall study revealed the *Typha anyustata, Marsilea minema, Carex fedia, Hydrilla verticillata* were all the most tolerant aquatic plants in the pond. Though may aquatic species grow in the study site yet most of them showed very poor IVI values less than 50. Altogether 5 species have IVI values more than 50 (Table 1.2) and they may be considered as dominant, 50 which were either suppressed by the dominant weed and were not getting suitable physical and Environmental growth requirement.

Acknowledgement

The authors are thankful to the managing Director and Principal of Khusro Memorial Degree College, Bareilly.

References

Bachmann, R.W. 1990. Climatic influence on variations in water transparency in lake west akobojilaba U.S.A Tawa, Cad, Sci. 97 (4): 142-145.

Baruah, P.P and Baruah, C.K. 2000. Study of the hydrophytic flora of Kaziranga National Park Assam, India Annals of forestry 8(2) : 170-178.

Curtis, J.T. and Maintosh, R.P. 1950. The interrelationships of certain analytic and synthetic phytosociological characters, Ecology, 31 : 434-455.

Granberg, R. 1973. The eutrophication and pollution of lake poinjanne, cetral finland, Ann. Bot. Fenn 10 : 267-308.

Hanson, H.C. and Churchill E.D. 1961. The plant community Rein hold publishing corporation, New York Plant, Sci. 12(1) : 35-40.

Islaam, M. 1999. A study on the certain aquatic macrophytes of lentic habitate of Dibrugarh District, Assam, Ad. Plant Sci., 12(1) : 35-40.

Kumar, J.I.N. and B.C. Rana 1989. Variation in primary productivity of the phytoplankton of Tarapur pond Gujrat, India, Ind. Bot., Conractor 6(3) : 95-98.

Mishra, R. 1968. Ecology work book Kolcata.

Rao, Nageshwar Y. and P. Balasubaramanyan 1993, Phytosociological analysis of wetland vergetation in poin calimere wild life sanctuary Tamilnadu Ind. J., forestry 16(2) : 144-150.

Sharma S. and P.K. Singhal 1988. Impact of floating and emergent vegetation on the trophic stratus of tropical lake. The Macrophytes and physicochemical status. J. Environ., Biol., (3supple) : 303-311.

Sharma, S.C., and J.S. Dhakre 1993. Aquatic angiosperms of Shahjahanpur district U.P. Indian J. Forestry (Edditional Series) 7(4): 223-233.

Simola H., I. Hanski, Mlukk oenen 1990. Stratigraphy species richness and seasonal dynamics of plankton diatom during 418 years in lake Lavojarvy south finland. Ann., Bot. Penn. 27(13) : 241-259.

Yadava, Y.S., R.K., Singh, M. Chaudhry and V. Kolekar 1987. Limnology and Productivity of Dighalli Beel (Assam) Trop. Ecol., 28:137-146.

Please Cite This Article As:

Saltanat Ara Malik and Atul Namdeo. 2010. Phytosociological Study of Macrophytes in a Polluted Pond of Shahjahanpur (India). J. Exp. Sci. 1(5):01-03.