

Nutrient Assessment of Jathi Pond (District-Chapra) With Special Reference to Aquatic Macrophytes

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Abstract

Jathi Pond 250.88'N Latitude and 840.74' E Longitude Chapra town is situated on the bank of Sarayu river on the Southern side near the Gandak on the Eastern Side. Jathi Pond located about 1 km away from Chapra Kacheri Railway Station. This pond falls on the road side and near the Railway line towards Musarakh Railway Station. The whole water area of the pond is about 3 hectares and depth of water varies from 1 meter to 5 meters. During the flood and rainy season the water area is further increased. The bank of pond is made of soils only and source of water is rain and also from flood of Sarayu and Gandak rivers. Nutrients are the major abiotic factor which influence the richness of species and their abundance.

Nutrients are utilized directly by the plants and then these nutrients are transferred to the other trophic levels of the ecosystem through the food chain. Vegetation often acts as a nutrient pump, taking up nutrients from the soil translocating them to the shoot and releasing them on the marshy surface when they die. Nutrients available in water and sediments often in aquatic ecosystem affect the composition and richness of Macrophytes which ultimately affect the species diversity and Biomass of the other aquatic fauna. About 36 species of macrophytes varieties were recorded in "Jathi Pond" Chapra (Saran district), Bihar.

Key words: Aquatic macrophytes, Nutrients status, Tropical level, Food chain, Jathi pond.

Introduction

The water area of "Jathi Pond" is about 3 hectares and depth of water from 1 meter to 5 meter. During the flood and rainy season the water is further increased (Kumari Veena, 2002). The bank of pond is made of soils and also only source of water is rain and also from flood water of Sarayu and Gandak rivers. Natural ponds are large standing water bodies which are self regularly and self-sufficient (Welch, 1952). Water is aptly described as the mother of life and it is the most precious gift of the nature. Due to unique hydrological properties it has supported the development of a very complex biotic community on the earth. About 71% of earth surface is covered with water (Schworebel, 1987). Wetlands and land transitional between terrestrial and aquatic system, where the water table is usually at or near the surface or the land is covered with shallow water (Cowardin et al. 2012). Other notable contribution are those of Subramanyam, K. 1962, Singh, N.P. and Mudgal, V. 2001.

Macrophytes are the major primary producer of a water body. They not only provide food to the consumers but also provide shelter to the macro invertebrates and control nutrient cycle. Distribution of macrophytes and their ecological role in an aquatic ecosystem have been well studied by Maheshwari (1960). Nutrient dynamics is one of the major aspect in limnological studies of water bodies. In ponds, nutrient from water and soil enter into macrophytes and then passes to different trophic levels of food chain. Therefore, the study of nutrient dynamics especially with reference to aquatic macrophytes, elaborates the ecology of benthos with special reference to the dynamics of nutrient and their bio-geo chemical cycle in the benthic region of Jathi pond.

Materials And Methods

Monthly sampling of surface and bottom water was carried out from November 2015 to October 2017 during morning hour. The samples were analysed by the methods as prescribed by Michael (2000), Trivedy et al. (1987), APHA (1991). Macrophytes were identified with the help of Keys (Cook, 1974).

Results And Discussion

About 36 species of macrophytes varieties were recorded in "Jathi Pond" Chapra (Saran district), Bihar. As shown in the table 2 sodium level was recorded between 0.85 mg/L in July 2017 and 1.25 mg/L in the month of June 2017. Sodium level increases gradually throughout the year expect monsoon. Potassium level was recorded between 7.07 mg/L in August 2018, and 14.37 mg/L in June 2016 and the trend of fluctuation in its level shows that the macrophytes accumulates potassium during winter and summer. Calcium level was recorded between 13.15 mg/L in August 2016 and 38.98 mg/L in August 2017.

Magnesium level was recorded between 4.90 mg/L in August 2018 and 8.88 mg/L in June 2017. The level of Nitrogen in benthic macrophytes was recorded between 15.59 mg/L in August 2017 and 28.31 mg/L in August 2016. Phosphorus level in benthic macrophytes was recorded between 0.51 mg/L in September 2016 and 0.63 mg/L in July 2017 and 0.73 mg/L in August 2017. Nutrients are the major abiotic component influencing density and diversity of aquatic plant and animals. The nutrients absorbed by the plants are utilized by themselves and are also transferred to the other trophic level.

Macrophytes acts as storage compartment of different nutrient available in water and soil. Nutrients uptake and translocation are species-specific and macrophytes have distinct threshold for uptake and translocation of each nutrients (Bristow and Whitcombe, 1971). Macrophytes absorb nutrients from water and sediment the requirements of nutrients are more in the phase of growth and reproduction gradual increase in level of all the macrophytic nutrients was also absorbed in during winter and summer season are represented by the growth phase of macrophytes. After first shower of monsoon rain, the level of macrophytic nutrients was observed in lower ranges in the season new plants grow.

The highest level of Ca⁺ in macrophytes may be due to higher level of this nutrients in water and soil which is readily absorbed by the plants. During growth phase of macrophytes (Winter and late monsoon) a decrease in the level of nutrients in water and soil was observed which is due to its accumulation by the macrophytes. The decrease in the level of nutrients of sediment

was more prominent than that of water which indicates that the benthic macrophytes absorbed nutrients mainly from sediments.

A gradual increase in the level of all nutrients in water and soil was observed during decomposition phase of macrophytes (Summer and early monsoon) which is due to return of these nutrients from decomposing macrophytes to the sediment and water.

About 36 species of macrophytes varieties were recorded in “Jathi Pond” Chapra (Saran district) Bihar (Table 1).

The nutrients like sodium ranges from 0.86 mg/L to 1.26 mg/L . Potassium ranges from 7.08 mg/L to 14.68 mg/L , Calcium ranges from 13.16 mg/L to 38.99 mg/L , Magnesium ranges from 4.91 mg/L to 8.89 mg/L, Nitrogen ranges from 15.60 mg/L to 28.32 mg/L Phosphorus ranges from 0.52 mg/L to 1.26 mg/L.

The nutrients like Ca²⁺, Mg²⁺, Na⁺ and K⁺ influence the diversity and distribution of aquatic Macrophytes.

Table - 1 Macrophytes encountered in Jathi Pond, Chapra (Saran District), Bihar.

Sl. No.	Family	Species	Status
1.	.Nymphaeaceae	<i>Nymphaea stellate</i> Wild	E
		<i>Nelumbo nucifera</i> Gaerth	E,FE
2.	Haloragidaceae	<i>Myriophyllum tuberculatum</i> Roxb.	Sb
3.	Menyanthaceae	<i>Nymphoides indicum</i> (Linn.) O. Ktze	FE
4.	Trapaceae	<i>Trapa natans</i> , L. var. <i>bispinosa</i> Roxb.	RF, E
5.	Canvolvulaceae	<i>Ipomoea aquatic</i> Forsk.	FF, Mg
6.	Lentibulariaceae	<i>Utricularia inflexa</i> Var.	Sb, FF
		<i>Stellaria</i> (Linn f.) taylor	Sb, FF
		<i>Utricularia aurea</i> Lour	Sb, FF
7.	Amarnathaceae	<i>Amaranthus tenuifolia</i> Wild.	Mg
8.	Polygonaceae	<i>Polygronum barbatum</i> Linn.	Mg
9.	Ceratophyllaceae	<i>Ceratophyllum demursum</i> Linn.	Sb
10.	Hydrocharitaceae	<i>Ottelia alismoides</i> Linn.	Sb
		<i>Hydrilla verticillate</i> (Linn. F)Royle.	Sb
		<i>Vallisneria spiralin</i> Linn.	Sb
11.	Pantederiaceae	<i>Eichomia crassipes</i> (Mart.) Solms.	SF, FF
12.	Lemnaceae	<i>Lemna minor</i> Linn.	FF
		<i>Spirodela polyrrhiza</i> Linn.	FF
13.	Potamogetonaceae	<i>Potamogeton crispus</i> Linn.	Sb
		<i>Potamogeton natans</i> Linn.	Sb

		<i>Potamogeton nodosus</i> Poir.	Sb
		<i>Potamogeton pectinatus</i> Linn.	Sb
14.	Najadaceae	<i>Najas minor</i> All.	Sb
		<i>NNajas indica</i> Wild.	Sb
15.	Cyperaceae	<i>Cyperus rotundus</i> Linn.	Mg
		<i>Cyperus pumilus</i> Linn.	Mg
		<i>Scirpus articulatus</i> Linn.	Mg
		<i>Scirpus supinsus</i> Linn.	Mg
16.	Typhaceae	<i>Typha angustata</i> Bory and Chaub	Mg
17.	Marsileaceae	<i>Marsilea quadrifolia</i> Linn.	Mg
		<i>Marsilea minuta</i> Linn.	Mg
18.	Characeae	<i>Chara zeylanica</i> Wild.	Sb
19.	Salviniaceae	<i>Azolla pinnata</i> R.Br.	FF
		<i>Salvinia spirodela</i>	FF
20.	Cyperaceae	<i>Eleocharis dulcis</i>	Mg
		<i>Enhydra fruti scens</i>	Mg

Table 2 Monthly variation in nutrient contents mg/L of benthic macrophytes of Jathi Pond Chapra, Saran District in Bihar.

YEAR	MONTH	Na(mg/L)	K(mg/L)	Ca(mg/L)	Mg(mg/L)	N(mg/L)	P(mg/L)
2015	Nov	0.94	8.24	16.11	6.13	18.83	0.78
	Dec	0.95	8.85	18.10	6.37	20.78	0.91
2016	Jan	0.93	9.80	20.18	7.28	21.28	0.93
	Feb	0.98	10.85	22.00	7.31	23.67	0.95
	Mar	1.00	11.84	24.35	7.57	24.81	1.07
	Apr	1.02	12.64	25.90	8.14	25.44	1.11
	May	1.03	13.01	26.37	8.27	26.50	1.11
	June	1.04	14.37	27.42	8.88	27.51	1.25
	July	1.06	14.20	35.80	8.86	28.31	1.25
	Aug	1.07	13.86	38.98	5.78	28.31	0.51
	Sep	0.94	7.61	15.45	5.87	16.87	0.51
	Oct	0.97	7.33	13.25	6.42	16.24	0.56

	Nov	1.08	8.10	16.04	6.58	17.62	0.63
	Dec	1.08	9.04	17.54	6.65	18.77	0.70
2017	Jan	1.03	9.20	20.42	7.11	20.10	0.77
	Feb	1.02	10.07	22.52	7.31	21.05	0.93
	Mar	1.03	10.86	24.01	7.31	21.05	0.93
	Apr	1.05	12.01	28.90	8.10	23.20	1.17
	May	1.02	13.20	34.58	8.14	24.14	1.10
	June	1.25	13.53	38.98	8.10	24.30	0.63
	July	0.85	7.20	16.67	5.25	15.75	0.63
	Aug	0.86	7.07	13.15	4.90	15.59	0.73
	Sep	0.87	7.85	15.30	5.95	16.48	0.82
	Oct	0.87	8.95	20.44	6.38	17.53	0.92

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