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A study of monthly variation in biomass and primary productivity of macrophyte of Hardia wetland of Saran District of North Bihar, India

Chitralekha Sinha*
P.G. Department of Zoology, J.P. University, Chapra, Bihar, India

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Abstract : The wetland has profuse growth of macrophyte *Potamogeton* sp., *Polygonum* sp., *Nelumbo* sp. were observed as floating and among submerged *Chara* sp., *Nitella* sp., *Ceratophyllum* sp. were dominant. Macrophyte form an important component of wetland ecosystem as it increases the surface area for food and shelter to invertebrates, fishes and birds. The macrophytes are considered as producer of water bodies as they receive radiant energy in the form of food upon which all aquatic life depends. So it helps in stabilizing the ecosystem. They contributed to the major chunks of biomass production of the wetland. *Hydrilla* sp. was the most dominant among submerged weeds. It was present almost throughout the year. During the first year of study the dry biomass of *Hydrilla* sp. ranged from 24 g/m^2 in Aug'12 to 172 g/m^2 in March'12. The intensity of light available to macrophytes per unit area is greater in the tropical water and its physico-chemical characteristics are vital factors besides temperature for the growth of macrophytes. In the present study low pH has been found for favourable growth of macrophytes. A fall in N, P, K, Ca and Mg in the water during growing period relates to increase in macrophytic biomass.

Keywords : Growth of macrophytes, growing period, profuse growth, radiant energy, producer, dominant, intensity of light, physico-chemical characteristics, vital factor, favourable growth

INTRODUCTION

The rate at which the green plant produces the biomass or store energy is referred as primary product. The primary productivity of aquatic ecosystem gives the quantitative details regarding energy fixation and its availability to support the bioactivity of the total ecosystem.[1] Biomass is associated with its productivity, biologically efficiency and with other community having same type and different type of communities. Macrophyte form an important component of wetland ecosystem as it increases the surface area for food and shelter to invertebrates, fishes and birds.

The macrophytes are considered as producer of water bodies as they receive radiant energy in the form of food upon which all aquatic life depends. So it helps in stabilizing the ecosystem.

Primary productivity of wetlands has been studied extensively abroad and in our country.[2-11]

The present study deals with the biomass and primary production of Hardia Wetland.

*Corresponding author :
Phone : 8210708417
E-mail : chitralekhasinhateacher@gmail.com

MATERIAL & METHODS

PRIMARY PRODUCTIVITY OF MACROPHYTES:

It was assessed by the Harvest method[12] and was measured as changed in the Biomass Values. The biomass was estimated as the dry matter/unit area. The productivity was calculated on the basis of increase in the biomass in a unit area in a particular time.

Calculation:

For the calculation of productivity the biomass per unit area was estimated at suitable intervals.

Productivity= $(B_2\text{-}B1)/D$ dry wt./m^2/day

Where; B_1=Biomass g/m^2 at time t_1

B_2=Biomass g/m^2 at time t_2

D=Days interval between t_1 and t_2.

RESULTS

Several varieties of macrophytic species were observed in the wetland of which *Potamogeton* sp., *Hydrilla* sp. and *Chara* sp. among submerged were found to be dominant forms. They contributed to the major chunks of biomass production of the wetland. *Hydrilla* sp. was the most dominant among submerged weeds. It was present almost throughout the year. During the first year of study the dry biomass of *Hydrilla* sp. ranged from 24 g/m^2 in Aug'12 to 172 g/m^2 in March'12. The average standing crop production was 101.58g dry wt/m^2. The annual net and daily net production was 143.0g dry wt/m^2 and 0.40g dry wt/m^2. The dry biomass of *Potamogeton* sp. ranged from 20 g/m^2 to 97 g/m^2 in the first year and from 20 g/m^2 to 96 g/m^2 in the second year. The dry biomass of *Chara* sp. varied from 19 g/m^2 to 154 g/m^2 in the first year and from 20 g/m^2 to 112 g/m^2 in the second year. The average standing crop production indicate that the mean value are of *Hydrilla* sp. 101.58 g dry wt/m^2 in the first year and minimum was that of *Chara* 47.75 g dry wt/m^2 during second year of study. The annual net production was minimum of *Potamogeton* sp. 68 g dry wt./m^2 in the second year and maximum was of *Hydrilla* sp. 143.0 g dry wt/m^2 in the first year of study. The daily net production was minimum 0.26 g dry wt./m^2 of *Potamogeton* sp. and maximum 40 g dry wt./m^2 of both plants *Chara* sp. and *Hydrilla* sp. during first year of study. (Table: 1,2, fig:1,2)

Table 1- Monthly variation in biomass and primary productivity of macrophyte (2011-13) values in g/m^2

Month	Macrophyte		
	Potamogeton	*Hydrilla*	*Chara*
November	97	164	104
December	84	166	127
January	57	168	130
February	34	154	154
March	25	172	147
April	10	134	104
May	8	74	87
June	*	*	*
July	2	32	48
August	27	24	19
September	46	67	44
October	54	64	87
November	72	76	96
December	96	98	112
January	84	107	84
February	64	74	66
March	56	67	55
April	58	42	51
May	*	*	*
June	*	*	*
July	20	17	20
August	38	36	22
September	57	44	41
October	88	67	46

Note: "*" Site was dry.

Table 2- Primary productivity value of macrophyte (2011-13) values in g dry wt./ m^2

Macrophytes	Average Standing Crop		Annual Net Production		Daily Net Production	
	2011-12	2012-13	2011-12	2012-13	2011-12	2012-13
Potamogeton sp.	37	51.91	95	68	0.26	0.18
Hydrilla sp.	101.58	52.33	143	90	0.4	0.24
Chara sp.	87.58	47.75	135	90	0.4	0.24
Total	226.16	151.99	373	248	1.06	0.66

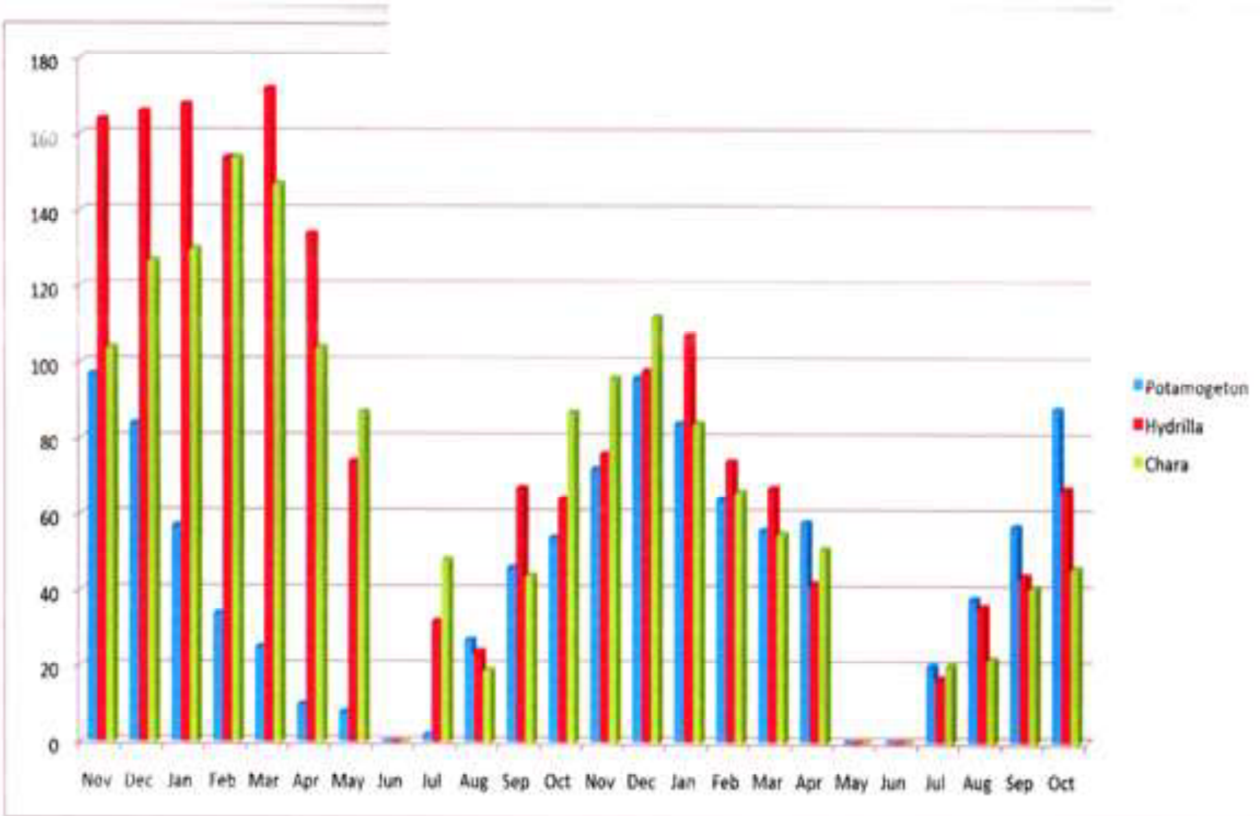

Fig.-1: Monthly variation in Biomass and primary Productivity of Macrophyte (2011-13) values in g/m^2.

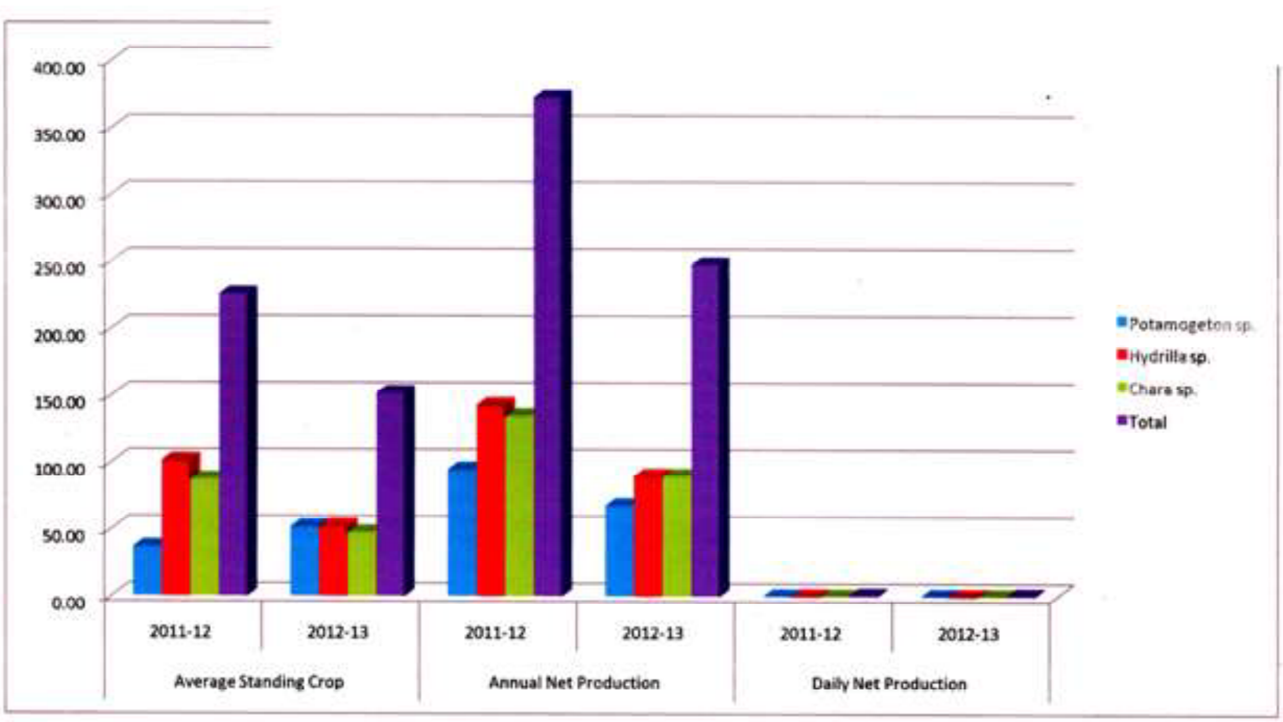

Fig.-2: Primary Productivity value of Macrophyte (2011-13) values in g dry wt./ m^2

DISCUSSION

The productions of hydrophytes are governed by various hydrological parameters. Light is the most important factor regulating the growth of submerged aquatic plants.[13] The intensity of light available to macrophytes per unit area is greater in the tropical water and its physico-chemical characteristics are vital factors besides temperature for the growth of macrophytes. Sen and Chaterjee (1960)[14] observed higher pH for the better growth of hydrophytes but in the present study low pH has been found for favourable growth of macrophytes. Our result also matches with that of Sharma and Munshi (1995)[8] in Kawar lake wetland. Nutrient especially phosphorus is the single nutrient regulating production.[15] The biomass and productivity was quite good due to large amount of nutrients available in the sediment. The site receives large amount of nutrients from surface runoff and agricultural practices during dry season. The lowest value of nitrates and phosphate were observed during the period of maximum vegetation. Both calcium and magnesium has vital role in productivity in the wetland. They are in good quality. A fall in N, P, K, Ca and Mg in the water during growing period relates to increase in macrophytic biomass. Alkalinity and conductivity value indicates rich productivity capacity of the wetland.

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