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STUDIES ON PRODUCTIVITY OF *TYPHA ANGUSTATA* BORY AND CHAUB. IN A SUBTROPICAL LOTIC WATER BODY OF JAMMU-INDIA.

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Biomass production of *T. Angustata* was studied for a period of two years in a slow running, spring fed stream. Biomass production being effected by a number of factors like nature of the water body, floods, higher rate of biotic interference, nutrient status of the water and the bottom sediment

Keywords : *Typha Angustata*; Biomass; factors.

Introduction

The perusal of literature reveals that studies in lotic water (running water) bodies especially the stream, have completely been ignored in this country. A few stray references occur that too pertain to the plankton productivity (Vijavaraghavan, 1971; Sreenivastava, 1963, 1965; Nasar and Munshi 1975 and Srivastava, 1972). The study of lotic water bodies is very interesting from the point of view that qualitative and quantitative changes in the water concentration are continuous and very rapid, which effect the periodicity, distribution and productivity in general either by adding or by removing the nutrients from the stream.

In the present investigations, studies were carried out for a period of two years to assess the rate of biomass production of *T. angustata* in the Gadigarh stream, Jammu (J&K State) India. Physiography of the stream has been dealt elsewhere (Anand, 1977).

Materials and Methods

Samples for analysis of macrophytic biomass were collected at random using a quadrate $1m^2$. At least five replicates were collected from each station of the stream regularly during the last week of every month. The samples were washed thoroughly in running water. Root and shoot portions were separated and oven dried

at 60°C for 24 hrs and the dry weight was recorded.

The methods followed, for determination of net production and organic matter, are those of Ovington *et al.*, (1963). Wilde *et al*, (1972) and turn over value was calculated according to the method suggested by Misra (1974).

Results and Discussion

Thus the growth of *Typha angustata* in Gadigarh stream is limited not only by the inavailability of the nutrients (because of lotic nature of the present water body) but also by high biotic interference, floods, presence of silt in the boitom sediments, high turbidity of water caused by incessant and seasonal rains along with the occasional inpour from the Ranbir Canal distributaries.

It may be pointed out that the rate of eutrophication is higher in the stream. It is further being enhanced due to the conversion of surrounding area of the stream into agriculturable lands Thus narrowing the strem's dimensions and threatening its existence in the near future.

Hutchinson (1975) stated that species of *Typha* are ecologically quite tolerant. It bears an extensive, deep penetrating root system. Present study reveals that the plants begin to sprout in the middle of February and show a luxuriant growth in the proceeding months. The organic matter was recorded to increase during February to June and July. The monthly temperature varies from 30 to 37°C during June and July and is considered to be an optimumal growth temperature. The maximum biomass production was recorded in the month of July and maximum during December and January. (Table 1-3, Fig 1). The major part of the day during the rainy season remains cloudy as compared to a clear and bright summer day, thereby strengthening the opinion of Hutchinson (1975) that cloudy days with intermittant bright sunshine enhances the biomass production in case of emergent vegetation.

Proceeding heavy monsoon rains lower the nutrient status of the stream through dilution and increased rates of water flow. It effects the rates of biomass production in case of phytoplankton, submerged and floating plants of the stream (Anand 1977) but not the rooted emergent vegetation.

August onward no further increase in biomass was observed. In the subsequent months the plants become older pale, die and decompose. The low organic production *T angustata* during December–February may be due to low tempe-

rature as also reported by Meyer and Anderson (1952), Jha (1968), Nasar and Munshi (1975) and Misra (1974).

The dry matter production of the plant at seven stations of the stream expectedly showed a significant variation (Table 4). The daily mean net production calculated for above ground (shoot) part of the standing crop was in the range of 3.346 to 22.2 g/m²/day. The highest dry/matter production was recorded at station IV (1369.591 g/m²/month) for the month of December, 1974 (Table 1-3; Fig. 1). The underground plant parts (rhizome) also followed almost a similar trend (Tables 1-3; Fig. 1) and the production values ranged from 0.95-5 4 g/m²/day (Table 5). The highest underground dry matter production was at Station IV and lowest at Station II (Tables 1-3; Fig. 1). Such a great difference between the maximum and the minimum dry matter productions seemed to depend upon several factors amongst which the biotic interference and the nature of the habitat played most important role in the present water body. While working on the productivity of macrophytes in lakes Dal and Anchar of Kashmir, Kaul and Vass (1972) arrived at a similar conclusions.

Turnover values calculated for shoot and root, ranged from 0.51-0.792 which would indicate that 51-79% of biomass production was replaced each year (Table 6). The turn over values (78-92%) recorded for *T. angustata* by Kaul Vass (1972) for Kashmir lakes are higher than the figures obtained for Gadigarh stream. Obviously it speaks about the different types of habitat. Being a lotic water body, the productivity rates were quite higher in the Gadigarh stream. The water and bottom sediments, which are alkaline in nature, have higher nutrient status, coupled with the sandy silt soil and shallowness of the stream favoured the growth of *Typha*.

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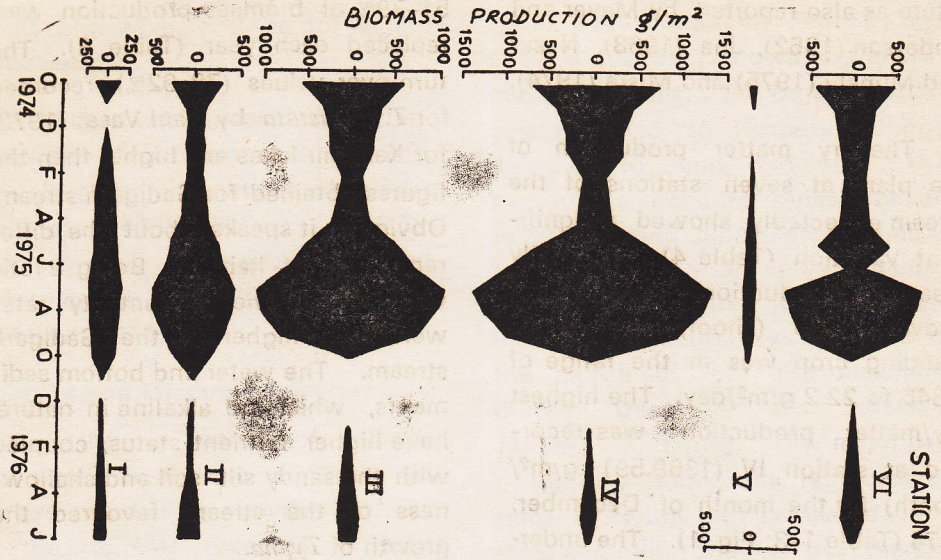

Fig 1 Biomass production (g/m²/month) of above ground parts of *Typha angustata* at stations I to VI in the stream Gadigarh.

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Table 1. Biomass production of *Typha angustata* (g/m²/month) at Station I and II.

Period	STATION I				STATION II			
	Above ground		Under ground		Above ground		Under ground	
	Dry wt.	Ash wt.	Dry wt.	Ash wt.	Dry wt.	Ash wt.	Dry wt.	Ash wt.
1974								
October	138.0	13.9	41.2	4.4	282.6	28.3	41.5	4.4
November	–	–	–	–	106.5	11.2	27.4	2.5
December	–	–	–	–	87.7	9.7	18.3	2.1
1975								
January	55.2	6.9	12.7	1.9	97.4	15.8	28.9	3.3
February	70.5	7.8	16.5	1.9	85.0	17.6	20.0	2.2
March	105 0	12.4	25.2	2.4	126.3	15.9	19.8	3.1
April	112.0	11.3	30.5	2.8	135.2	15.5	35.7	5.3
May	125.5	12.78	31.51	2.9	255.8	30.5	113.9	15.1
June	140 0	13.4	40.9	4.8	329.5	44.6	94.5	11.8
July	160.0	16.5	51.8	5.1	454.8	56.7	149.1	16.5
August	160.0	17.5	51.4	5.4	422.8	58.3	134.6	15 3
September	155.0	18.4	44 8	4.9	338 0	70.6	110.4	12.9
October	131.0	14.8	41.2	4.4	212.4	22.4	10.1	9.6
November	–	–	–	–	–	–	–	–
December	–	–	–	–	–	–	–	–
1976								
January	12.9	0.9	6.7	0.8	20.2	1.5	4.7	0.3
February	24.7	1.9	10.4	1.2	24.8	2 3	6.1	0.7
March	40.1	3 8	13.8	1.4	38.7	3.5	10.4	0.8
April	41.9	4.1	12.8	1.6	76.2	8.1	16.4	1.7
May	52.3	5.7	14.1	2.1	102 8	9.9	22.5	2.5
June	55.1	6.2	14.4	1.6	105.5	12.5	23.4	2.6

Table 2. Biomass production of *Typha angustata* (g/m²/month) at Station III and IV.

Period	STATION III				STATION IV			
	Above ground		Under ground		Above ground		Under ground	
	Dry wt.	Ash wt.	Dry wt.	Ash wt.	Dry wt.	Ash wt.	Dry wt.	Ash wt.
1974								
October	583.5	69.6	212.1	16.6	732 6	55.5	212.1	21.2
November	329 5	35.5	108.7	7.1	446.0	34.2	108.7	10.8
December	258 7	23.2	73.4	6 8	341.9	31.2	73.7	7.5
1975								
January	232.1	24 5	80.4	6.1	324.7	31.3	80.4	8.1
February	114.7	17 4	30.2	2 8	128 5	17.3	30.2	13 1
March	153 9	18.9	36.7	4.3	170.2	20.4	27.7	5.1
April	182.1	20.8	51 9	4 7	206 1	26.9	51.9	5.6
May	512.6	49.7	64.7	14.5	6 8.4	88.4	164.8	16.3
June	708 6	96.9	265.1	28.7	998.1	134.2	258.3	32.1
July	1059.7	196.6	440.3	43.3	1369.6	217 9	440.3	50 8
August	948.6	136 2	385.3	39.1	1211.8	197.5	685.3	45.2
September	764.1	121.7	309.7	24.4	967.6	180.6	309.7	37.8
October	–	–	–	–	–	–	–	–
November	–	–	–	–	–	–	–	–
December	9.1	0.41	8.4	0 6	–	–	–	–
1976								
January	21 3	1.8	6.2	0.6	–	–	–	–
February	42.2	4.1	8.5	0.8	18.4	1.8	11.9	1.2
March	70.2	6 5	16.6	1 5	40.2	3.7	13.4	1.3
April	103.7	9.9	24.3	2.2	70.6	6.9	20.6	2.2
May	111.5	12.3	30.1	3.2	80.5	9.5	30.5	3.4
June	88.4	9.1	32.9	3.7	21.6	2.4	16.4	2.1

Table 3. Biomass production of *Typha angustata* (g/m²/month) at Station V and VI.

Period	STATION				STATION			
	Above ground		Under ground		Above ground		Under ground	
	Dry wt.	Ash wt.	Dry wt	Ash wt	Dry wt,	Ash wt	Dry wt.	Ash wt.
1974								
October	39.1	4.1	–	–	435.3	34.1	125 4	14.0
November	–	–	–	–	213.0	22.5	80.1	7.7
December	–	–	–	–	175.5	20.1	45.1	6.0
1975								
January	–	–	–	–	140.1	15.1	42.6	4 9
February	18.7	2.1	–	–	99.5	12.1	21.0	2.6
March	31.3	3.1	–	–	137.4	16.5	39.3	4.1
April	39.4	4.3	–	–	159.1	17.7	42.3	4.2
May	53.2	4.7	–	-	386.7	48.2	199.8	9.6
June	53.7	5.1	–	–	79.1	73.8	148.4	12.4
July	64.4	7.1	–	–	769.8	107.0	277.3	28.0
August	62.0	6.2	–	–	685.8	99.1	214.1	25.2
September	60 6	6.2	–	–	561.1	54.4	175.5	20 2
October	–	–	–	–	–	–	–	–
November	–	–	–	–	–	–	–	–
December	–	–	–	–	12.4	1.1	6·2	0.3
1976								
January	–	–	–	–	21.4	2.3	8.8	0.7
February	–	–	–	–	45.7	5.1	14.6	1.5
March	–	–	–	–	70.8	7.8	23.2	2.1
April	–	–	–	–	98.7	10.6	28.7	2.4
May	–	–	–	–	124.1	13.7	32.3	3 6
June	–	–	–	–	41.7	4.1	23.5	2.1