

# Studies on the Growth of Grass carp, *Ctenopharyngodon idella* (Cuvier and Val.) Fed on Amphibious Plant *Zizania latifolia* under Intensive Fish Culture

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**Abstract-**Intensive aquaculture management process, the growth of grass carp, *Ctenopharyngodon idella* fed on indigenous amphibious plant were studied, for the period of ten( 10) months in ponds having an area of 1ha and 1.5 ha respectively. Feeding of food plant is carried two times in a day i.e. 10AM and 4PM, 20 – 25% of the body weight. The whole plants body is use as food of grass carp. The four species reared along with grass carp attained a weight of 2550g and 2155g in 10 month of rearing period (March to December). The study highlights that feeding of rare indigenous amphibious plant, mostly habited in wetland areas inundated by Loktak lake shows highest food conversion ratio.

**Keywords-** *Ctenopharyngodon idella*, wetland, amphibious plant, Loktak lake, Food conversions.

## I. INTRODUCTION

Fish production in ponds can be increased both by bringing more water areas under culture as well as producing more from the areas already in use. The grass carp utilizes macro-vegetation including certain types of grass as its food and hence the name. If grass carp is to be raised in ponds it would require regular supplies of weeds to be made for feeding the species. Grass carp has pharyngeal teeth and adapted to tearing plant material. This would be necessary as herbivorous fishes have to rely on mechanical breakdown of plant cell walls. The presence of grass carp seems to be helpful in the bottom dwelling common carp and mrigal. Some of the terrestrial and aquatic weeds can be utilized as feed for this fish [13]. Hence the grass carp, *C. idella* has been successfully used in different parts of the world for controlling aquatic weeds ([14], [1]). Due to its fast growth and compatibility with other carps it has been included in polyculture of Indian and exotic carps commonly known as intensive composite culture in India. In North Eastern Hill Region of India generally in Meghalaya, grass carp *Ctenopharyngodon idella* (Val.) is widely preferred species by the farmers as they are cold tolerant and found to perform very well, attaining about 1.0 – 1.2kg in a year [9]. The growth studies of grass carp feed with hybrid napier grass, where the species had attained an average weight of 366.94 g in 182 days [15]. The present investigation was taken up to study the absolute growth and the growth pattern of grass carp feed on amphibious plant *Zizania latifolia* which is found preferable food item inhabited in the wetland areas of the central valley of Manipur

specially Lotak lake. This plant shows highest food conversion ratio and the fish can grow upto 2550g in 240 days.

## II. MATERIALS AND METHODS

The experiment were conducted on two ponds (1.0 ha and 1.5 ha) at private fish farm, Hiyangthang Village, Imphal West II District, Manipur. Both the ponds were fed water from nearby Waisel River. Water in them was periodically replenished to compensate the loss by way of seepage and evaporation. Both the ponds were stocked at the rate of 5000 and 7500 yearlings/ha, with Indian major carps (*Catla catla*, *Lebeo rohita* and *Cirrhinus mrigala*) and three exotic carps (*Hypophthalmichthys molitrix*, *Ctenopharyngodon idella* and *Cyprinus carpio*) at the ratio 40:30:30 respectively. Liming is done @300 kg/ ha/ yr.

The ponds were manured with the organic and inorganic fertilizers. The organic manure is raw cow dung from local cattle yard and inorganic fertilizers were urea @ 200 kg / ha /year, Single super phosphate@ 400 kg / ha/ year and muriate of potash @ 50 kg / ha / year in equal monthly installment. The details of input used during the experiments are given in the table 1.

The fishes were fed on a mixture of Rice brand and mastered oil cake in the ratio 1:1 @ 2% body weight. The pond having an area of 1.5 ha were devoid of feeding of amphibious plant *Zizania latifolia* but feed only hydrilla were broadcast all over the water surface @ 25% of the body weight two times in a day i.e. morning and evening. The fodder leaves alone were initially cut into small pieces for feeding upto one month and subsequently the entire plant was put into the enclosures and the unconsumed hard stems of fodder plants were removed. The fishes were sampled once a month to assess their growth. The water sample also analysed for pH, dissolved Oxygen, free carbondioxide, total alkalinity, according to the standard methods and the water temperature were recorded [2].

## III. RESULTS

The atmospheric temperature recorded at the time of sampling was in the range of 12.3-34.5°C (average of 24.4°C) while that of pond water was 12.5-33.2°C. The dissolved oxygen was in the range of 4.9 -6.4 ppm and free carbondioxide, 7 ppm. The

pH of the pond water ranged from 7.5-8.4. The grass carp had recorded the highest growth under moderate stocking density. The grass carp attained an average weight 2550g and 2155g in 1.0 ha and 1.5 ha ponds respectively. The corresponding gross production of the carp was 1912 kg / ha/ 10 months and 1260 kg / ha / 10 months from the two ponds. The contribution of grass carp to the total fish production in 1.0 ha pond was 41% whereas stocking percentage was only 15 % in the other pond (1.5 ha), the contribution of the grass carp was 39.90 % against stocking percentage of 15% only. Details are given in table 2.

#### IV. DISCUSSION

The grass carp under composite fish culture can attain the weight upto 5 kg in a rearing period of one year when fed on aquatic weed, Hydrilla species [10]. The grass carp attained the weight ranging from 75 to 520 gm in 182 days, when fed on hybrid napier [15] and recorded the daily growth rate of 1.72 g which was very low when compared to that of the present study.

The grass carp fingerling showed a better growth performance (0.071g/day) when fed with with *Azeratum conyzoid* when compared to the aquatic weed *Azolla* and *Lemna*[3].

Using napier grass recorded a growth rate of 10-11 g/day/fish at a stocking density of 515-520/ha [6]. But these ponds were heavily infested with aquatic weed *Enhydris anquistipetela* and were also regularly fertilized with organic and inorganic manure. These additional sources of feed might have been utilized by the grass carp for their growth.

The growth of grass carp fed with *Azolla* was remarkably high (1.65g/ fish/ day) and the total production of fish was 185.76kg in 150 days [12].

The growth increment of grass carp fed with four different terrestrial weed was *Ageratum conozoides* (0.0646 g/ day), *Biden pilosa* (0.0354 g/day), *Galinsoga perviflora* (0.2476 g/day), and *Crassocephalum crepidioides* (0.166g/day) [16].

The growth studies carried out in India and abroad indicate that daily growth rate of grass carp varies from 1.7 g to 14.7 g/day [1], [5], [7], [8], [10]). The growth rate recorded in the present study is quite comparable to these results.

The consumption of feed was greatly reduced in the month of December and January when mean air temperature was 0°C. The growth rate consequently retarded in December and January compared in November, when mean air temperature was 0°C. The food ingestion of grass carp at low temperature is irregular and may increase if temperature rise by 24°C and feeding becomes intensive at temperature above 16°C [11]. But in the present studies feeding intensity increases at temperature above 21°C. The gross conversion ratios in the present study were 41% and 39.90% in 1.0 ha and 1.5 ha ponds respectively. The gross conversion ratio for grass carp fed on hybrid napier grass were also recorded as 48:1 and 26.99:1([6], [15]).

The grass carp has strong and specialized pharyngeal teeth for rasping aquatic vegetation. Fishes above 30 cm, the pharyngeal teeth are thick and tend to have double and flattened serrated cutting and rasping surface. This helped the larger fishes to masticate the leave of long hard plants and fibrous grasses [7]. This study also help to showed that the rate of growth become faster after attaining 50 g of weight which could be explained on the basis of better utilization of plants after attaining that size.

The large quantity of faeces produced by the grass carp to high feed consumption may also serve as feed for the bottom feeder in a poly culture [4].

From the above discussion it may be inferred that amphibious plant, *Zizania latifolia* and other terrestrial grasses can easily converted into fish flesh through pond ecosystem. Further, the food which passing through the gut in less than 8 hours at 28-30°C is semi-digested and can directly or indirectly support a large biomass of other species of fishes[7]. In the present study, feeding of *Zizania latifolia* grass casrp attained an excellent average growth of 2550 g/10 month in the pond rearing of grass carp and with other bottom feeder species (*Cyprinus carpio* and *Cirrhinus mrigala*). Faeces coming out of the grass carp utilized by common carp attained an average growth of 490 g/10s month.

#### V. CONCLUSION

The utilization of amphibious plant *Zizania latifolia* as food plant of grass carp in intensive farming is one of the cheapest way to increase the fish production from wetland areas in Manipur. Feeding of the plant shows highest food conversion ratio. Above all, production of grass carp would also increase the socio economic status of the farmers and as well as for state.

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TABLE I: Details of inputs of the experiments in ponds at private fish farm Hiyangthang

ITEMS	POND 1.0 ha		POND 1.5 ha	
	Quantity (kg)	Amount (Rs.)	Quantity (Kg)	Amount (Rs.)
Fish seed	5000 Nos.	50,000/	7500 Nos.	75,000/
Master oil cake	4000	40,000/	6000	60,000/
Raw Cow dung	10,000	6000/	15,000	9000/
Single superphosphate	200	6000/	300	9000/
Muriate of Potash	50	1100/	75	1650/
Lime	300	2000/	450	3000/
Water Charge		2000/		3000/
Zizania latifolia fodder		3000/		
Labour charge(for 10 months)		50,000/		75,000/
Contingency		4500/		5500/
Total cost of input		169100/		241150/
Output:				
Total Fish production ( kg ):	4628 kg		4736 kg	Rs. 50.91
Cost of production (Rs/Kg):				
Production (per ha. Kg):	4628 kg	Rs. 36.35	3157 kg	
( in 10 months)				

Table no. II: Growth pattern, Percentage of contribution and survival rate of carps in two ponds.

Pond area (ha)	Date of Stocking	Date of Harvesting	Stocking density per ha.	Fish combination	Species ratio (%) (No)	No. of fish fingerling stock (Nos.)	Wt. of fish at the time of stocking (g)	Survival(%)	Av. Wt. at the time of harvested (g)	Total Wt. contribution by the species wise (Kg)	% contribution of species wise
1.0 (ha)	22/3/2015	2/12/15	5000	Catla. Silver carp. Rohu. Grass carp. Mrigal. Common carp.	20	1000	55	94	950	893	19.3
					20	1000	43	93	755	698	15.9
					15	750	34	95	650	462	9.98
					15	750	135	100	2550	1912	41.31
					15	750	37	90	480	315	6.80
					15	750	32	95	490	348	7.51
										4628	
1.5 (ha)	22/3/15	3/12/15	7500	Catla. Silver carp. Rohu. Grass carp. Mrigal. Common carp.	20	1000	54	94	945	883	18.64
					20	1000	48	93	735	678	14.31
					15	1125	32	95	640	547	11.54
					15	1125	162	100	2155	1890	39.90
					15	1125	34	90	450	364	7.68
					15	1125	33	95	470	401	8.46
										4736	