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Growth potential of Grass Carp, *Ctenopharyngodon idella*, Val. in Saline water with an Aquatic weed *Potamogeton pectinatus* as feed

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The Growth potential of farmed grass carp, *Ctenopharyngodon idella* were studied at seven different salinities (3-9). The chinese strain grass carp was selected as production reference. The result showed a significant growth rate ($p < 0.01$) upto 6 ppt saliniity. At lower salinities the consumption of brackishtwater weed *potamogeton pectinatus* was found to be high thereby accilerating the growth. The result also suggests that the growth potential of grass carp has generally been underestimated at salinities upto 7 ppt Therefore, small scale production of grass carp is feasible in low saline areas particularly the salinity affected agricultural areas.

Key words: Grass carp, *C. idella*, growth rate, sallinity, *P. pectinatus*, brackishwater weed.

The grass carp, *Ctenopharyngodon idella* is a natural inhabitant of Flatland rivers of China and the middle and lower reaches of river Amur (Russia) later introduced into many countries of the world. Though a riverine fish of freshwater habitat, this species can also tolerate slightly brackishwater habitats (Talwar & Jhingran, 1991). Historically aquaculture involving the movement of fish from one salinity to another has been dealt mostly with the use of known estuarine fish or seafish such as Mullets, *Mugil cephalus*, *M. capito* (Mires, 1970, Mires *et al.*, 1974) and the Milkfish *Chanos chanos* (Hora & pillay, 1962) in freshwater or brackishwater ponds. Recently work is concentrated on the inroduction of freshwater and euryhaline fish to saline waters in order to utilize the otherwise wasted areas of brackish foreshore water and saline marshes following the trends in Indonesia and Phillipines (Pawley, 1963). Fluctuations in salinity over the range of 0-2 ppt considerably accelerate the growth of juvenile Russian sturgeon, *Acipenser gueldenstaedti*; carp, *Cyprinus carpio* and white amur, *Ctenopharyngodon idella* by increasing the efficiency of food conversion to growth (Konstantinov *et al.*, 1993). The present study has been undertaken to find out the salinity range for optimum growth and tolerable limits affecting growth. The results are expected to throw more light on cultural problems and possibilities in saline waters.

Materials and Methods

The experiment was conducted in a properly ventilated, lighted, roofed area in cylindrical ferrocement tanks of 500 litres capacity with outlet facilities at the side wall of the bottom portion. In each tank ten numbers of chinese strain grass carp fingerlings were stocked (15.16 ± 0.28 g) At every nine days interval, the salinity of water was

increased at the rate of 1 ppt starting from 3 ppt onwards and continued upto 9 ppt. *Potamogeton pectinatus* a brackish water weed was provided as feed to to experimental animals upto satiation. The consumption rate and leftover weed was recorded everyday. The various physico-chemical parameters like dissolved oxygen, salinity, temperature and total alkalinity were measured at every nine days intervals by using standard methods (Apha, 1955). The growth increments were recorded at every 9 days intervals before the fishes were reared in next higher salinity. Data were analysed by analysis of variance (ANOVA) method (Snedecor & Cocharan, 1967).

Results and Disussion

In the present study the salinity of water was raised form 3 to 9ppt and the growth was significant upto 6 ppt ($p < 0.01$). The results showed a correlation between salinity and weed consumption rate (Table 1). The weed consumption/ day ranged from 0.011 g at 9 ppt to 8.61 g at 6 ppt. The reared grass carp showed a positive growth from 3 to 6 ppt and a retardation in growth from 7 to 9 ppt (Table 1). At 9 ppt salinity, the test animals almost stopped feeding. *Potamogeton pectinatus* was well accepted by grass carp fingerlings which suggest that this brackishwater weed can be grown in saline areas to feed the cultured grass carp. Fluctuations in salinity over the range of 2ppt considerably accelerated the growth of white amur, *Ctenopharyngodon idella* by increasing the efficiency of food conversion (Konstantinov & Martynova, 1993). The submerged aquatic weed *Potamogeton pectinatus* was very effectively controlled within a period of one year by triploid grass carp in Florida Lake (Venter & schoonbee, 1991). After 6 ppt salinity the consumption of weed was reduced and the fishes were under stress. The stress was observed visually by their lethargic movement and emaciated body condition. The highest growth was observed in 6ppt salinity i.e. 3.3 g/9 days. The FCR varied from 2.61 to 5.45 (Table 1) which in significant ($p < 0.01$) at 6 ppt salinity. Similarly the specific growth rate (SGR) is lowest at salinity 4 ppt i.e 0.63 and highest at 6 ppt i.e. 1.68 which is significant ($p < 0.01$). Konstantinov & Martynova (1992) has reported that water salinity fluctuations over the range of 0-2 ppt accelerated the growth of grass carp and increased the efficiency of food utilization for growth. They also reported that the

Table 1. Growth particulars of test animals at different salinities

Salinity ppt	Initial weight (g)	Final weight (g)	Growth (g)	Average consumption day/fish (g wet wt)	FCR	SGR
3	15.16±0.28	17.16±0.47	2.0±0.2b	5.27	2.65±0.2b	1.37±0.11b
4	17.16±0.47	18.16±0.35	1.0±0.2c	5.31	5.45±1.1a	0.63±0.13d
5	18.16±0.35	20.16±0.30	2.0±0.1b	5.50	2.75±0.14b	1.16±0.07c
6	20.16±0.30	23.46±0.28	3.3±0.1a	8.61	2.61±0.08b	1.68±0.05a
7	23.46±0.28	22.70±0.30	-0.7	3.74	—	—
8	22.7±0.30	22.10±0.46	-1.0	3.16	—	—
9	22.1±0.46	21.16±0.3	-0.6	0.011	—	—

Figures having different super-scripts a, b, c, d differ significantly in a column

Table 2. Physico chemical parameters of water during the experiment

Salinity ppt	Dissolved oxygen ppm	PH	Water temp °c	Total alkalinity ppm	Free co_2
1	2.1	8.4	24.5	96	Nil
4	2.1	8.4	24.5	96	"
5	3.4	8.4	27.0	98	"
6	2.6	8.6	26.1	106	"
7	2.9	8.5	28.1	108	"
8	2.4	8.4	30.0	100	"
9	2.6	8.4	30.3	110	"

salinity fluctuations reduced the respiration intensity and oxygen expenditure per unit of increment, i.e., optimized the energetics of the fish and were more favourable to them than stable conditions. The present study suggests that salinity upto 6 ppt the growth of fish is not affected and weed consumption rate also maximum. Abhusamadov (1986) reported that the larvae and figerlings of white Amur migrate into the coastal areas of the Caspian sea where the salinity was 6-12 ppt and they remained there until sexual maturity. Maceina & Shireman (1980) reported dietary conversion rates of grass carp were less efficient at 3 and 6 ppt salinities than in fresh water growth is reduced slightly at salinites of 3 and 6 and greatly at 9 ppt. Their study also indicated that grass carp could inhabit brackishwater estuaries of salinities upto 9 ppt. However during the present investigation the growth retardation was observed only beyond 6 ppt salinity. Kasim (1983) has reported that among carps, the common carp is highly tolerant to salinity, mrigal is the least tolerant and the fringelipped carp is intermediate.

The temperature of water fluctuated between 24 to 30°c throughout the experiment. The dissolved oxygen concen-tration was very low with a range of 2 to 3, 4 ppm (Table 2) the latter being the highest at salinity 6. The total alkalinity values ranged between 90 to 110 ppm, PH were found to be in optimum range and the free carbondioxide was absent (Table 2).

The present study suggest that grass carp can be reared upto 6 ppt salinity without affecting the growth and feed consumption after acclimatization in saline water.

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