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Effect of Graded Levels of Dietary Stress Care on Growth, Survival and Body Composition of Common Carp, *Cyprinus carpio*

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'Stress care', a product from Indian Herbs Ltd., was evaluated for its effect on growth of common carp through dietary incorporation. The indoor culture system with aeration and water circulation and without aeration and water circulation were used for the growth study for 60 days. Three levels of stress care at 0.15, 0.50 and 0.75% of the diets were fed to common carp fry. Incorporation of stress care did not produce any beneficial changes in the growth and survival of common carp. However, its effect on common carp under stressful culture conditions needs to be investigated further.

Key words: Stress care, carp feed, *Cyprinus carpio*

The exotic carp, *Cyprinus carpio* is widely distributed in freshwaters of temperate, sub-tropical and tropical countries. This is cultured widely and is ranked third in terms of aquaculture production (FAO, 1992). India is endowed with vast expanse of inland water resources which are at present not being adequately exploited (Mehboob & Sheri, 1997).

Incorporation of steroid hormones as growth promoters in fish feeds is not encouraged due to health consciousness among consumers which necessitates a search for other growth promoting substances. Evidences indicate that hormone enhances growth by stimulating greater voluntary food intake and substantially improving food conversion (Matty, 1986). Indian Herbs Ltd., Saharanpur, U.P., India have manufactured and released a product called 'stress care' which is known to reduce natural stress in farm animals and poultry, thereby improving growth and survival. It has been claimed that stress care improves glucose metabolism, protein synthesis and corticosteroid sparing effect in poultry (Murthy *et al.*, 1999). The objective of the present study was to test the effect of stress care on the growth, survival and body composition of exotic carp, *C. carpio* in indoor closed water recirculatory system with and without aeration and water circulation.

Materials and Methods

Indoor closed water recirculatory system consisting of 24 fiber glass tanks of 120 l capacity each and arranged in two tier pattern was used for the study. Waste water from culture tanks was allowed to biofilter tanks, wherein it was filtered biologically in the three tanks which contained graded layers of sand and gravel, oyster shells and clam shells respectively. The filtered water was pumped to an overhead tank of 2000 l capacity, from where water flowed back to the culture tanks by gravity (Murthy, 1977).

Common carp fry (2.36±1.3 g) were acclimatized to the laboratory conditions by feeding a control diet. Fishes were then stocked in the experimental tanks at the rate of 10 per tank in triplicate groups and

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designated as S_0, S_1, S_2 and S_3 treatments corresponding to 0, 0.25, 0.50 and 0.75% stress care in the diets. The experiment was carried out in two rearing conditions i.e., with aeration and water circulation and without aeration and water circulation. The test diets (pellets) were prepared using fishmeal, groundnut cake and rice bran as protein sources keeping crude protein level at 30% (Table 1).

Fish were fed to satiation with respective experimental diets in triplicate groups. Leftover feed was siphoned out after allowing one hour feeding time daily and the unconsumed feed was dried and pooled treatment-wise to quantify the actual intake of feed by fish. Each tank was covered with nylon-meshed lid to avoid jumping and escape of fishes. Fortnightly sampling of fish was carried out to record the growth in terms of weight and length. The experiment was conducted for a duration of 60 days.

Water samples drawn from each tank were analysed for various water quality parameters such as pH, dissolved oxygen, free carbon dioxide, total alkalinity and total ammonia following standard methods (APHA, 1998). Water temperature in the culture tanks was also recorded using an ordinary thermometer.

The proximate composition of the experimental diets and carcass composition of fish were determined according to AOAC (1995). Nitrogen-free extract (NFE) was calculated as carbohydrate by the difference method of Hastings (1976). The calorific content was calculated using the physiologi-

Table 1. Ingredient proportion and proximate composition of the test diets

	Diet			
	S_0	S_1	S_2	S_3
Ingredient				
Fish meal (%)	18	18	18	18
Groundnut cake (%)	44	44	44	44
Rice bran (%)	22	22	22	22
Tapioca flour (%)	8	8	8	8
Ragi flour (%)	6	6	6	6
Vit. and min. premix (%)	1.5	1.5	1.5	1.5
Common salt (%)	0.5	0.5	0.5	0.5
Stress care (%)	0.0	0.25	0.5	0.75
Proximate composition*				
Moisture (%)	6.1 (0.15)	5.6 (0.11)	6.0 (0.02)	6.00 (0.04)
Crude protein (%)	29.3 (0.08)	30.1 (0.14)	30.0 (0.05)	30.2 (0.03)
Crude fat (%)	2.7 (0.12)	2.2 (0.03)	2.5 (0.06)	2.4 (0.04)
Crude fiber (%)	3.7 (0.05)	3.6 (0.04)	3.8 (0.02)	3.5 (0.07)
Ash (%)	16.3 (0.15)	16.1 (0.01)	16.1 (0.02)	15.3 (0.06)
Nitrogen-free extract (%)	41.8	42.4	41.6	42.7
Caloric content ($kj.g^{-1}$)	10.8	10.8	10.8	11.9

* Expressed as percentage of dry weight; Figures in parentheses indicate standard errors

Table 2. Water quality parameters recorded in different treatments

	With aeration and water circulation				Without aeration and water circulation			
	S_0	S_1	S_2	S_3	S_0	S_1	S_2	S_3
Temperature (°C)	27-30	27-31	27-31	28-30	28-31	28-31	27-30	27-31
pH	7-7.8	7.6-8.2	7.2-7.7	6.6-8.3	6.8-7.8	7.6-8.2	6.6-8.3	7.0-7.6
Dissolved oxygen ($mg.l^{-1}$)	6.31-8.31	4.34-5.63	5.31-6.48	5.36-6.37	4.59-6.26	4.96-6.18	4.96-6.31	4.34-5.63
Free carbon dioxide ($mg.l^{-1}$)	1.3-1.8	1.3-1.5	1.2-1.5	1.6-2.3	2.1-2.6	1.7-2.3	1.3-1.5	1.2-1.5
Total alkalinity ($mg.l^{-1}$ of $CaCO_3$)	85.84-96.34	83.84-96.34	71.84-98.94	73.31-86.43	98.34-108.34	96.36-113.38	96.41-118.41	108.30-124.89

cal values of 5 kcl.g^{-1} for protein and 9 and 4 kcal.g^{-1} for fat and carbohydrate, respectively (Smith, 1975; Hastings, 1975). The growth data obtained after the termination of the experiment was tested using one-way analysis of variance technique (Snedecor & Cochran, 1980).

Results and Discussion

The mean and the range of various water quality parameters recorded are presented in Table 2. The details of growth of fish (weight), survival, specific growth rate (SGR), food conversion ratio (FCR) and protein efficiency ratio (PER) are summarized in Table 3. Maximum growth was recorded in control groups of both the systems. In tanks with aeration and water circulation, the growth rate was higher in the group which was not given 'stress care'. The trend was the same in the system without aeration and circulation. The best survival of common carp was observed in system with aeration and circulation. Analysis of carcass composition showed no significant difference in quality of flesh of fish fed different experimental diets (Table 4).

Some of the feed additives and growth promoters like G-probiotic which contains yeast and B-complex vitamins have been used in fish feeds. It was reported that best growth of common carp was induced by 2g.kg^{-1} of G-probiotic in the diet (Kumar, 1994), while in tilapia 7.5g.kg^{-1} of G-probiotic gave best growth (Naik *et al.*, 1999). Stafac-20, which has 2% viriginiamycin as an active ingredient, induced maximum weight gain

Table 3. Weight gain, survival, SGR, FCR and PER of common carp fed graded levels of stress care in two systems

	With aeration and water circulation				Without aeration and water circulation			
	S_0	S_1	S_2	S_3	S_0	S_1	S_2	S_3
Initial weight (g)	2.43±0.02	2.66±0.03	2.53±0.01	2.67±0.02	2.50±0.01	2.52±0.01	2.63±0.01	2.69±0.01
Final weight (g)	5.31±0.17	5.00±0.02	4.67±0.09	4.82±0.10	4.56±0.13	4.44±0.09	4.16±0.03	4.44±0.07
Weight gain (g)	2.85±0.18	2.34±0.04	2.14±0.08	2.15±0.10	2.06±0.12	1.93±0.08	1.53±0.02	1.75±0.06
% weight gain	118.52	87.97	84.58	80.52	82.40	76.19	58.17	65.06
Survival (%)	63.33±12.02	53.33±3.33	83.33±6.67	60.00±5.77	80.00±5.77	56.67±3.33	66.67±8.82	50.00±5.77
SGR	1.02±0.04	0.84±0.02	0.82±0.02	0.79±0.03	0.80±0.04	0.76±0.02	0.61±0.00	0.67±0.10
FCR	4.47±0.17	5.69±0.13	5.89±0.25	5.94±0.17	4.86±0.05	5.04±0.27	6.18±0.18	6.4±0.10
PER	0.78±0.01	0.59±0.01	0.56±0.02	0.56±0.02	0.70±0.00	0.66±0.03	0.51±0.01	0.52±0.01

Average of three values with standard error

Table 4. Carcass composition (%) of common carp fed graded levels of stress care

	With aeration and water circulation				Without aeration and water circulation			
	S_0	S_1	S_2	S_3	S_0	S_1	S_2	S_3
Moisture	79.60 (0.42)	80.09 (0.93)	79.10 (0.78)	79.12 (0.97)	77.93 (0.34)	77.78 (0.24)	77.95 (0.34)	78.18 (0.16)
Protein	17.26 (0.12)	16.99 (0.31)	17.59 (0.23)	17.70 (0.32)	16.89 (0.12)	16.17 (0.21)	16.17 (0.09)	15.99 (0.20)
Fat	1.91 (0.04)	1.86 (0.09)	1.78 (0.10)	1.73 (0.02)	1.18 (0.08)	1.17 (0.05)	1.16 (0.01)	1.06 (0.18)
Ash	1.90 (0.12)	2.05 (0.09)	2.15 (0.08)	2.12 (0.08)	2.06 (0.04)	2.10 (0.08)	2.06 (0.05)	2.16 (0.04)

Average of three values (expressed on wet weight basis) with standard error

in catla fry and mahseer fingerlings at 100 ppm level (Kumar, 1994). Incorporation of other feed additives like Aquagran and Nutripro-Aqua of natural origin are reported to stimulate higher growth in common carp (Singh, 1993).

The present study did not indicate any positive effect on the growth, survival or body composition of the common carp due to the incorporation of stress care in the diet. In fact, there was a reduction in weight gain and survival rate due to the incorporation of stress care, under the experimental conditions (Table 3). However, in the present study there were no acute stressful conditions. Hence, further studies are necessary to evaluate the effect of stress care on growth and survival of common carp reared under stressful conditions such as high stocking density.

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