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Growth, Survival and Body Composition of Tilapia, *Oreochromis mossambicus* Fed Graded Levels of Stress Care

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The effect of feeding graded levels of stress care, a stress releasing agent for farm animals and poultry, on the growth, survival and carcass composition of tilapia, *Oreochromis mossambicus* was studied. Stress care, at different levels, was added to a fish meal based diet. The experiment was conducted in indoor closed recirculatory system for two months. Results showed that higher survival of tilapia was obtained with a diet containing 0.75% stress care but growth rate was not influenced by the presence of stress care.

Key words: ***Oreochromis mossambicus*, growth, survival, body composition, stress care**

Tilapia, *Oreochromis mossambicus*, (Peters) is an omnivorous cichlid and comparatively easy to feed. It can be cultured in freshwater, brackishwater and sea water because of its euryhaline and hardy nature. Initially, tilapia species was regarded as a menace in the culture ponds due to its prolific breeding habits, low growth rate and poor acceptance by the consumers. But at present, realizing its potential, several measures are being adopted for viable culture of the species.

When fishes are cultured in high densities, the growth and survival comes down due to stress (Jhingran, 1991). Stress care, a product of Indian Herbs Ltd**. Saharanpur, U.P., India, is reported to reduce natural stress in animals and improve growth and survival. It has also been claimed by the manufacturers that stress care improves glucose metabolism, protein synthesis and corticosteroid sparing effect in poultry. Further, it is reported that it helps to overcome temperature related stress in winter and summer. Even though fish experience various kinds of stress in culture ponds, there are no reports of the use of stress-reducing substances in fish feeds. In this study, an attempt has been made to test the effect of stress care on growth, survival and body composition of tilapia (*O. mossambicus*) in an indoor closed recirculatory system.

Materials and Methods

Farm-bred and reared fry of tilapia were used for the present study. Prior to the commencement of the experiment, they were acclimated to laboratory condition for seven days and fed a formulated control diet. The experiment was conducted for a period of 2 months in indoor closed water recirculatory system using 12 fibre glass tanks of 120 l capacity each. A continuous water flow was maintained at 1 l/min, after passing through a three stage biological filter (Murthy, 1997). Constant photoperiod of 12 h light and 12 h dark was maintained.

Diets were prepared incorporating commercially available stress care at three graded levels namely 0.25 (T_1), 0.5 (T_2), and 0.75%

*For Correspondence; **Mention of Company's name does not endorse its use

Table 1. Ingredient proportion (%) and proximate composition of experimental diets

	Diets			
	T_0	T_1	T_2	T_3
Ingredients % by weight				
Fish meal	20	20	20	20
Groundnut cake	45	45	45	45
Rice bran	15	15	15	15
Tapioca flour	18	18	18	18
Vitamin and mineral mix	2	2	2	2
Stress care	0	0.25	0.50	0.75
Proximate composition (%)*				
Moisture	4.76 (0.14)	5.03 (0.22)	5.27 (0.23)	5.29 (0.18)
Crude protein	29.78 (0.20)	30.25 (0.18)	30.59 (0.15)	30.81 (0.01)
Crude fat	4.43 (0.09)	4.46 (0.25)	4.57 (0.16)	4.49 (0.10)
Crude fibre	7.78 (0.12)	7.36 (0.53)	6.34 (0.04)	6.56 (0.15)
Ash	9.28 (0.49)	8.87 (0.48)	9.32 (0.11)	9.56 (0.15)
Nitrogen-free extract	43.97	44.03	43.91	43.29
Caloric content (kJ/g)	15.28	15.40	15.49	15.40

*Average of 3 values (expressed on dry weight basis), figures in parentheses indicate standard error.

(T_3). Diet without stress care served as control (T_0). The basal diet was formulated with a crude protein content of 30%, using fish meal and groundnut cake as major protein sources (Table 1).

The proximate composition of the basal diet was analysed according to AOAC (1995). Nitrogen free extractives (NFE) was calculated by the difference method of Hastings (1976). The caloric content of the basal diet was calculated using physiological fuel values of 5 K cal/g for protein (Smith, 1975) and 9 and 4 K cal/g for fat and carbohydrate respectively (Hastings, 1975).

Fishes were maintained in three replicate groups and were fed twice daily at the rate of 10% of body weight. Unconsumed feed was siphoned out and weighed daily to determine actual food intake. Weekly fish sampling was done to record the weight gain and to adjust the amount of feed given.

Water samples drawn from each tank were analysed for pH, temperature, dissolved oxygen, free carbon dioxide, total alkalinity and ammonia, following standard methods (APHA, 1995).

Table 2. Mean and ranges (in parentheses) of water quality parameters observed in different treatments

Parameters	Diets			
	T_0	T_1	T_2	T_3
Temperature	28.33 (27.0-30.0)	29.67 (27.0-30.0)	28.67 (27.0-30.0)	28.33 (27.0-30.0)
pH	7.43 (6.60-8.30)	7.33 (7.00-7.80)	7.33 (7.00-7.80)	7.40 (7.20-7.70)
Dissolved oxygen (mg/l)	5.47 (4.96-6.18)	5.53 (4.59-6.26)	6.66 (5.83-7.64)	6.95 (6.38-7.54)
Free carbon dioxide (mg/l)	2.15 (0.84-2.96)	2.07 (0.72-3.65)	1.82 (0.85-2.63)	2.00 (0.21-3.96)
Total alkalinity (mg/l of $CaCO_3$)	113.34 (108.31-124.89)	85.74 (71.84-98.94)	89.52 (83.84-96.34)	55.38 (48.31-63.97)
Ammonia (mg/l)*	0.090 (0.009)	0.087 (0.009)	0.070 (0.006)	0.090 (0.015)

Average of three values. *Figures in parentheses indicate standard error for ammonia values

The mean weight gain of the fish at the end of the experiment was tested using one way analysis of variance (Snedecor & Cochran, 1980). Fish carcass composition was also analysed after the termination of the experiment following the standard methods (AOAC, 1995).

Results and Discussion

The proximate composition and energy content of the feed used in the experiment are given in Table 1. All diets had about 30% protein and were isocaloric. The mean values of water quality parameters recorded are shown in Table 2. There was no variation in water quality either due to feeds or due to the presence of stress care.

Data on the growth and survival of fish fed on the different diets are given in Table 3. Though T_1 induced highest growth among stress care incorporated diets, higher growth in terms of weight of tilapia was observed in control group (T_0). Effect of stress care on growth of tilapia was not clearly established in the present study. Maximum percentage weight gain, specific growth rate (SGR), food conversion efficiency (FCE) and protein efficiency ratio (PER) of tilapia was recorded in T_0 diet. However, higher survival was recorded in T_3 containing 0.75% stress care (Table 3). There was no significant difference in carcass composition of tilapia fed on different levels of stress care (Table 4).

Several feed additives are being used in fish feeds. Stafac-20, which contains 2% virginiamycin as an active ingredient, when incorporated at 60 ppm level in formulated diet and fed to catla fry and mahseer

Table 3. Weight gain, SGR, survival, FCE and PER of *Oreochromis mossambicus* fed graded levels of stress care-incorporated diets

Parameters	Diets			
	T_0	T_1	T_2	T_3
Initial weight (g)	1.33±0.02	1.52±0.02	1.48±0.02	1.43±0.01
Final weight (g)	4.91±0.03	4.75±0.04	4.30±0.04	4.05±0.05
Percentage weight gain	267.17^c	211.84^b	190.54^a	183.92^{-a}
Survival (%)	83.33^b±3.33	83.33^b±3.33	76.67^a±3.33	86.67^b±3.33
SGR (%)	2.33±0.02	2.03±0.01	1.91±0.05	1.86±0.04
FCE (%)	39.24±0.97	39.10±2.28	32.77±0.72	31.23±0.81
PER	1.38±0.03	1.29±0.07	1.07±0.02	1.01±0.03

Average of three values. Figures in the same row with same superscript do not differ significantly

Table 4. Carcass composition* of *Oreochromis mossambicus* fed graded levels of stress care

Parameters	Diets			
%	T_0	T_1	T_2	T_3
Moisture	77.14±1.02	76.83±0.89	74.74±0.69	75.60±0.73
Protein	14.49±0.20	13.34±0.16	13.64±0.10	14.00±0.19
Fat	1.82±0.10	1.97±0.04	1.88±0.03	1.92±0.02
Ash	2.76±0.06	2.42±0.03	2.90±0.10	2.78±0.04

*Average of three values expressed on wet weight basis

fingerlings, induced accelerated growth. In rohu, the optimum level of the above growth promoter was 100 ppm, (Kumar, 1994). Another similar substance, G-probiotic, was found to be effective for common carp at a level of 2 g/kg feed (Kumar, 1994). Other growth promoting agents such as Aquagran and Nutripro-Aqua of natural origin are also known to stimulate growth in fish (Singh, 1993; Kumar, 1994). But stress care, at low concentration in the feed, does not have any growth promoting effect under normal culture conditions. However, it was interesting to note that maximum survival of tilapia was achieved with 0.75% stress care in the diet.

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