EFFECT OF DIFFERENT RATION LEVELS OF ARTIFICIAL FEED ON THE GROWTH PERFORMANCE OF GENETICALLY IMPROVED FARMED TILAPIA (GIFT) FRY

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ABSTRACT: Evaluation of growth of genetically improved farmed tilapia (GIFT) in flow through system was studied for 8 weeks using different ration levels of the artificial feed. The experimental feed containing 26% crude protein was used @ 3%, 4% and 5% of fish wet body weight. Each treatment had two replicates. The design of the study was completely randomized (CRD) and the significance level was assessed through one way ANOVA. There were numerical differences observed for growth indices such as final body weight, net weight gain, percentage weight gain and specific growth rate (SGR) which were statistically non-significant ($P \geq 0.05$) between different ration levels except feed conversion ratio (FCR) which was found significantly different ($P < 0.05$) between 3% and 5% ration levels. While it remained non-significant ($P \geq 0.05$) between 3% and 4%. The physico-chemical parameters were within optimal range for tilapia growth. The performance of GIFT fry was comparatively better on 3% ration level of 26% crude protein diet which can be recommended for economical GIFT production.

Key words: GIFT strain, Growth, Artificial feed, Ration levels, Flow through system.

INTRODUCTION

Tilapia (the aquatic chicken) is one of the oldest cultured and economically important fish species worldwide (McAndrew 2000; Edwards 2000; Ispir *et al.* 2011). Early reproduction and successive reproductive cycles lead tilapia to overpopulation in aquaculture systems. This overpopulation produces competition for food which results in stunted growth (Balarin and Haller 1983). The scientists were thought to overcome this problem and developed Genetically Improved Farmed Tilapia (GIFT) strain (Lester *et al*. 1989; Baras and M`elard 1997) through selective breeding of *Oreochromis niloticus* which was practiced in Philippines (Eknath *et al.* 1993). GIFT project made this strain an exciting and replicable benchmark for future food security efforts (Sivan Yosef 2009).

The success of fish farming depends on maximizing production with minimum feed cost (Abdel-Hakim *et al.* 2006). The economic success of artificial feed depends upon appropriate feeding regime. Inappropriate feeding practices often lead to over feeding, pollution and higher production cost, while inadequate feeding may lead to stunted growth with high mortalities (Eroldogan *et al.* 2006). Knowledge of feeding rates and protein concentration is necessary to select appropriate feed quantity for a particular age group (Jauncey and Ross 1982; New 1988; Nguyen 1992). Tilapia is a voracious fish which grows very well on natural as well as plant based artificial diet (Al-Shamsi *et al.* 2006; Brown *et al.* 2007; Hafez *et al.* 2001). The aim of this study was to introduce GIFT strain in Pakistan and to evaluate its growth performance in captivity using different ration levels of artificial feed.

MATERIALS AND METHODS

The genetically improved farmed tilapia (GIFT) fry was imported from Bangkok, Thailand. The fish was maintained in fiber glass tanks for one week in quarantine and fed on 25% crude protein pelleted feed in Department of Fisheries and Aquaculture, UVAS. After one week, fish was divided into six groups and kept in cemented tanks (12' x 2.5' x 3' having 2.5' water levels) @ 60 fish/tank. Aerated freshwater was constantly supplied during the study period.

Feed ingredients and preparation of artificial feed: The detail of feed ingredients is given in Table 1. These ingredients were powdered grinded with mechanical grinder and well mixed manually. The prepared feed was packed in plastic bags and stored. The fish were fed with experimental feed 26% crude protein @3%, 4% and 5% body weight, twice a day during morning and afternoon for 8 weeks.

Fish growth studies: The fishes were monitored individually for their total body weight (g) and total body length (mm) during initial stocking and after every two weeks for 8 weeks. The fishes were released back to their respective tanks. The data: Net weight gain (NWG), percentage gain in weight (PGW), specific growth rate (SGR %) and feed conversion ratio (FCR) were calculated by following formulae:

NWG = Final weight (g) - Initial weight (g)
PGW = Final body weight (g) – Initial body weight (g) x 100/ Initial body weight
SGR = (ln final body weight – ln initial body weight) x 100/ No. of days of experiment
FCR =Feed given (g) / Wet weight gain (g)

Physico-chemical parameters: Temperature, pH, DO and TDS were studied on daily basis using standard methods as described by APHA (1998). The nitrates were determined on fortnightly basis with spectrophotometer ((IRMECO UV-Vis Spectrophotometer, Model: U2020).

Experimental design and statistical analysis: The data were analyzed through one way Analysis of Variance (ANOVA) under completely randomized design (CRD) using (Steel *et al.* 1997) on Minitab soft ware packages version 1.5. Tukey test was used to compare the treatment means.

RESULTS AND DISCUSSION

The data indicate that the growth of GIFT fry with the three ration levels did not differ significantly from each other (Table 2). The final body weight, net weight gain and percentage weight gain, final body length and increase in length are not significantly ($P \geq 0.05$) different in the fries of the three ration levels. Percentage gain in weight was found higher in 3% and 5% rations compared to 4% but was statistically non-significant ($P \geq 0.05$). SGR values were higher in 3% and 4% compared to 5%, but were statistically non-significantly different from each other ($P \geq 0.05$). Abdel-Hakim *et al.* (2009) reported non-significant differences in weight between fish assigned to different feeding regimes. Present results are in contrast to the findings of Dey *et al.* (2000) who reported daily growth rate (DGR) of 0.76g $fish^{-1}$ day^{-1} for GIFT tilapia fry. The growth parameters in the current study indicated that fish performed equally well under all the treatments while fish fed on 3% ration level performed comparatively better than 4% and 5%. This difference was also depicted from the FCR values where 3% ration level was significantly different from other two levels. Quiming and Yang (2004) reported FCR values of 0.8-1.2 when fed on artificial feed containing 28-30% crude protein at 2-4% body weight per day.

Water quality parameters for GIFT fry were monitored daily at 8:30 to 9:00 a.m. and were within optimum range which resulted into 0% mortality. No significant change for temperature, pH, salinity, TDS and nitrates was observed. The dissolved oxygen at 3% ration level showed significant difference to 4% and 5% ration levels (Table 3) which may be due to higher metabolic rate. Brett (1979) and Burel et al. (1996) stated that temperature acts as one of the key factors which directly affect metabolism, food intake and nutritional efficiency.

Table-1. Ingredient proportion and proximate composition of experimental feed

Ingredients	Proportion (%)	Crude Protein (%)
Fish meal	10	5.54
Maize gluten 60%	14	8.85
Rice polish	35	4.98
Wheat bran	40	6.63
Nutrimix	1.0	0.00
Total	100	26.00

Table -2. Comparison of growth parameters of GIFT with 26% CP at different ration levels (means are of two replicates with n = 60).

Parameters	3%	4%	5%	PSEM	*ANOVA P value*
Initial wt (g)	0.18^{a}	0.18^{a}	0.3^{a}	0.07	0.295
Final wt (g)	1.29^{a}	1.23^{a}	1.33^{a}	0.08	0.504
Net weight Gain (g)	1.10^{a}	1.05^{a}	1.03^{a}	0.09	0.746
Percent wt gain (%)	606.59^{a}	576.92^{a}	381.25^{a}	57.7	0.257
SGR%	3.25^{a}	3.19^{a}	2.56^{a}	0.39	0.287
FCR	0.92^{a}	1.3^{ab}	2.05^{b}	0.18	0.028
Initial length (mm)	24.6^{a}	24.6^{a}	25.9^{a}	3.07	0.757
Final length(mm)	42.2^{a}	38.7^{a}	37.6^{a}	3.92	0.544
Net increase in length (mm)	17.6^{a}	14.1^{a}	11.7^{a}	3.41	0.626

*Means having different superscripts are significantly different ($P < 0.05$).
PSEM= Pooled standard error of mean.

Table -3. Physico-chemical parameters of tank water of GIFT fry with 26% CP at different ration levels (means are of two replicates).

Parameters	3%	4%	5%	PSEM	ANOVA *P value*
Temp.	28.83[a]	28.62[a]	28.57[a]	0.509	0.602
DO	4.06[a]	4.64[b]	4.8[b]	0.29	0.001
pH	8.09[a]	8.2[a]	8.2[a]	0.093	0.231
Salinity	0.84[a]	0.83[a]	0.82[a]	29.5	0.745
TDS	1928[a]	1931[a]	1939[a]	0.022	0.404
Nitrates	0.00017[a]	0.00017[a]	0.00015[a]	0.005	0.636

*Means with different superscripts are significantly different (P< 0.05).
PSEM= Pooled standard error of mean.

Conclusion: It can be concluded that GIFT fry performed comparatively better on 3% ration level of 26% plant based crude protein diet to avoid feed loss and leaching of nutrients in to ecosystem.

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