Available Online at http://www.journalajst.com

ASIAN JOURNAL OF SCIENCE AND TECHNOLOGY

ISSN: 0976-3376

Asian Journal of Science and Technology
Vol. 5, Issue 6, pp. 348-351, June, 2014

RESEARCH ARTICLE

EFFECT OF FEEDING LEVELS ON THE GROWTH OF *TOR PUTITORA* AT FRY AND FINGERLING STAGE

***Simple Sawhney**

Department of Zoology, University of Jammu, Jammu (J&K) 180 001

ARTICLE INFO

Article History:
Received 03rd March, 2014
Received in revised form
11th April, 2014
Accepted 05th May, 2014
Published online 30th June, 2014

Key words:
%WG,
SGR,
FCR,
FCE,
PER

ABSTRACT

The effect of different feeding levels (viz., 1%, 3%, 5%, 7%, 9% and 11% of body weight) on the growth and food conversion ratio of *Tor putitora* at fry and fingerling stage was investigated for a period of 60 days to determine optimum feeding rate in laboratory conditions. The result of the experiments indicate that the fry obtained the highest average final weight with 9% feeding level, followed by 11%, 7%, 5%, 3% and 1%. There was insignificant difference (P>0.001) in final weight gain between 9% and 11% feeding level. The fingerlings obtained highest average final weight with 5% feeding level, followed by 7%, 9%, 3% and 1%. There was insignificant difference (P>0.001) in final weight gain between 5% and 7% and 7% and 9% feeding levels. Specific growth rate (SGR) and food conversion ratio (FCR) were better at 9% and 11% feeding level in fry stage. Similarly, specific growth rate (SGR) and food conversion ratio (FCR) obtained at 5%, 7% and 9% in fingerlings were better in comparison to 1% and 3% feeding level. The results of the study suggest that feeding a diet to fry at 9% and 5% body weight to fingerlings would be optimal for growth with less wastage of food and better economic returns in *Tor putitora* culture.

INTRODUCTION

In intensive aquaculture feed constitutes 30-60% of variable operating cost, meaning that effective feed management is crucial to the viability and success of fish farming operations of any species (Silva and Anderson, 1995; Goddard, 1996). The major constraint for developing a complete low cost diet is the paucity of the knowledge on the nutritional requirements specific to cultivable carps. Dietary nutritional requirement are more precisely determined through feeding purified diets under invitro conditions. Growth response, feed utilization and survival of fish when fed purified diets depend upon several factors. Of which feeding level is one of the most important factor. An understanding of the relationship between the rate of the feeding and rate of conversion of the food provided is of utmost importance in culture fisheries as it helps in avoiding wastage of the costliest input, feed and non assimilated factions of the food intake. Such wastage not only adds to the cost of production but also pollute the medium. On the other hand if the quality of feed is too low, the growth of fish may suppress due to starvation. Hence from economic standpoint the present study was carried to determine the optimum feeding level for *Tor putitora* fry and fingerlings, thereby giving best growth and food conversion ratio which is very important for effective management and successful commercialization of any fish species.

****Corresponding author: Simple Sawhney***
Department of Zoology, University of Jammu, Jammu (J&K) 180 001

MATERIALS AND METHODS

Diet Formulation

Two diets were formulated maintaining the total protein content of 45% for fry and 38% for fingerlings using ingredients viz. rice bran, fish meal, mustard oil cake, wheat flour, dead silk worm pupae and vitamin mineral mixture. (Table1). The proximate composition of the experimental diets (Table 2 & 3) was determined in the laboratory using standard methods. The crude protein content of diet was determined by Microkjeltec method and the value obtained was multiplied by the factor 6.25 to obtain crude protein value. The crude lipid content was determined by extraction using petroleum ether in a Soxhlet extraction apparatus for 16 hrs. The moisture content was determined by heating samples in oven at 105°C for 24 hrs. The ash content was determined by first igniting the sample and then heating it in a muffle furnace at 550 °C (±10 °C) for 6 hrs. (AOAC, 1995). Crude fiber was determined by acid and alkali digestion (Pearson, 1976). Nitrogen free extract which was considered as carbohydrate was calculated by difference method (Hasting, 1976). The calorific value of the feed was calculated in terms of KJ/g using the energy values of 9Kcal/g for fat, 4Kcal/g for carbohydrate (Hasting, 1976) and 5 Kcal/g for protein (Smith, 1975,Viola, 1977).

Growth Experiment

In the present study on *Tor putitora*, two experiments were conducted one on fry (0.24±0.04g) and other on fingerlings

Table 1. Proportion (%) of different ingredients used in the formulated diet for fry and fingerling

Ingredients	Diet for fry	Diet for fingerling
Fish meal	28.92	22.58
Rice bran	6.12	15.63
Mustard oil cake	28.92	22.58
Wheat flour	6.12	15.63
Dead silk worm pupae	8.92	22.58
Vitamin &mineral premix*	1	1

*Nutrimin Super forte (Rejuvenating combination of multivitamin & Multi minerals, AROSOL Chemicals PVT. Limited)

Vitamin A	700,000I.U	Vitamin D_3	140,000I.U
Vitamin E	250 mg	Folic acid	100 mg
Niacinamide	1000mg	Iron	1500 mg
Iodine	325 mg	Cobalt	150 mg
Magnesium	6000mg	Manganese	1500 mg
Zinc	3000mg	Selenium	10 mg
Potassium	100 mg	Sulphur	7.2 gm
Calcium	270gm	Phosphorous	130 gm
Copper	1200 mg	Fluorine	300 mg

(4.27±0.02g), for a period of 60 days. *Tor putitora* fry were collected from Anji fish farm, Reasi (J&K) and fingerlings were collected from Jhajjar Kotli, a tributary of Tawi river system. The experiments were conducted in triplicate in laboratory conditions in 100 l plastic tubs under flow through system along with use of aerators. *Tor putitora* fry were divided in to six groups with 20 fish each and fingerlings were divided in to five groups with 10 fish each. Prior to start of each experiment, both fry and fingerlings were acclimatized for 15 days to standardized experimental conditions prevailing in lab and to the experimental diet. The tubs were cleaned the next morning before feeding, by siphoning and replacing with an equal volume and the water parameters (Temperature, pH and dissolved oxygen) were taken weekly. The fish fry were fed @ 1%, 3%, 5%, 7%, 9% and 11% of body weight and fingerling @ 1%, 3%, 5%, 7%, and 9% of body weight, daily in the morning and left over fed was collected in the afternoon. The feed quantity was readjusted after every fifteen day

Table 2. Proximate composition (%) of formulated diet for fry

Parameter Diet	Moisture	Dry matter	Crude Protein	Crude fat	Ash	Crude fibre	Nitrogen free extract	Calorific content KJ/g
45%	8.97	91.03	44.03	11.11	8.80	3.12	23.97	17.43

Table 3. Proximate composition (%) of formulated diet for fingerling

Parameter Diet	Moisture	Dry matter	Crude Protein	Crude fat	Ash	Crude fibre	Nitrogen free extract	Calorific content KJ/g
38%	10.71	89.29	37.68	10.01	9.92	5.45	26.23	16.06

Table 4. Showing percentage survival, net weight gain, percentage weight gain (%WG), specific growth rate, food conversion ratio, food conversion efficiency, protein efficiency ratio of mahseer *Tor putitora* fry at different feeding levels

Feeding levels	Experimental Sets	Percentage Survival	Net weight gain (gm)	Percentage weight gain (%WG)	Specific growth rate (%)	Food conversion ratio (FCR)	Food conversion efficiency (FCE)	Protein efficiency ratio (PER)
1%	1	70	0.011	4.230	0.069	14.45	6.918	0.157
	2	70	0.009	4.285	0.069	14.26	7.009	0.159
	3	95	0.012	5.454	0.088	11.23	8.890	0.202
	Average	78.33	0.010	4.657	0.075	13.31	7.609	0.172
	SD	14.43	0.001	0.691	0.010	1.805	1.117	0.025
3%	1	90	0.05	21.73	0.327	8.68	11.51	0.261
	2	75	0.04	20.00	0.303	9.63	10.38	0.235
	3	95	0.05	20.00	0.303	9.45	10.57	0.240
	Average	86.66	0.046	20.57	0.311	9.25	10.83	0.245
	SD	10.40	0.005	1.004	0.013	0.503	0.60	0.013
5%	1	90	0.14	66.66	0.851	7.99	12.50	0.39
	2	95	0.15	57.69	0.759	7.45	13.41	0.36
	3	85	0.12	44.44	0.612	7..04	14.18	0.29
	Average	90	0.136	56.26	0.741	7.49	13.67	0.34
	SD	5	0.015	11.17	0.120	0.476	0.842	0.049
7%	1	85	0.16	76.19	0.943	7.73	12.92	0.29
	2	95	0.19	76.00	0.942	6..88	14.52	0.32
	3	80	0.18	64.28	0.827	7..36	13.57	0.30
	Average	86.66	0.17	72.15	0.904	7.33	13.37	0.31
	SD	7.63	0.015	6.818	0.066	0.426	0.803	0.018
9%	1	80	0.21	87.50	1.047	5.82	17.17	0.28
	2	90	0.25	89.28	1.063	6.23	16.05	0.30
	3	90	0.24	120.0	1.314	7.72	12.94	0.32
	Average	86.66	0.23	98.92	1.141	6.59	15.38	0.30
	SD	5.77	0.020	18.270	0.149	1.001	2.190	0.019
11%	1	85	0.21	80.76	0.986	5.99	15.16	0.22
	2	80	0.20	86.95	1.042	7.48	15.96	0.20
	3	90	0.24	96.0	1.120	7.50	14.01	0.24
	Average	85	0.21	87.9	1.050	6.99	15.04	0.22
	SD	5	0.020	7.659	0.670	1.002	2.001	0.018

Table 5. Showing percentage survival, net weight gain, percentage weight gain(%WG), specific growth rate, food conversion ratio, food conversion efficiency, protein efficiency ratio of mahseer *Tor putitora* fingerlings at different feeding levels

Feeding levels	Experimental Sets	Percentage Survival	Net weight gain (gm)	Percentage weight gain (%WG)	Specific growth rate (%)	Food conversion ratio (FCR)	Food conversion efficiency (FCE)	Protein efficiency ratio (PER)
1%	1	80	0.13	3.03	0.049	20.08	4.97	0.13
	2	70	0.14	3.29	0.054	18.51	5.40	0.14
	3	60	0.11	2.58	0.042	23.46	4.26	0.11
	Average	70	0.12	2.97	0.048	20.69	4.88	0.12
	SD	10	0.015	0.360	0.005	2.53	0.576	0.015
3%	1	80	0.76	17.71	0.271	10.87	9.19	0.24
	2	80	0.82	19.20	0.292	10.03	9.96	0.26
	3	70	0.71	16.55	0.255	11.70	8.54	0.22
	Average	76.66	0.76	17.82	0.273	10.87	9.23	0.24
	SD	5.773	0.055	1.330	0.018	0.834	0.710	0.018
5%	1	80	1.49	34.89	0.504	9.79	10.20	0.27
	2	90	1.48	34.49	0.493	9.72	10.28	0.27
	3	80	1.47	34.58	0.495	9.97	10.02	0.26
	Average	83.33	1.48	34.66	0.497	9.83	10.17	0.26
	SD	5.773	0.010	0.020	0.005	0.131	0.135	0.003
7%	1	80	1.41	32.86	0.485	9.90	10.11	0.18
	2	70	1.46	34.11	0.497	9.99	10.00	0.19
	3	70	1.45	34.03	0.482	10.01	10.09	0.19
	Average	73.33	1.44	33.67	0.488	9.96	10.06	0.18
	SD	5.773	0.026	0.698	0.008	0.141	0.132	0.004
9%	1	60	1.40	32.63	0.470	10.11	10.01	0.14
	2	80	1.42	33.02	0.475	9.89	9.98	0.14
	3	70	1.40	32.86	0.473	10.12	9.34	0.14
	Average	70	1.40	32.84	0.473	10.04	9.77	0.14
	SD	10	0.011	0.195	0.002	0.132	0.130	0.0003

sampling, based on the growth of fishes. The fishes from each tub were captured after every fifteen days and were weighed individually and their growth was assessed by calculating following growth parameters –

1) Percentage weight (% WG)

It was calculated by using the formula
$\%WG = [(W_f - W_i) / W_i] \times 100$
Where W_f is the final weight of the fish and W_i is the initial weight of fish.

2) Specific Growth Rate (SGR)

The formula used for calculating SGR was:
SGR= (ln Final weight–ln initial weight)/No. of days of experiment] x100

3) Feed Conversion Ratio (FCR)

The FCR was calculated by using the formula:
FCR = Feed fed / Gain in weight of fish

4) Feed Conversion efficiency FCE (%)
It was calculated by using the formula:
FCE (%) = [(Gain in wet weight of fish / Feed Fed)] x 100

5) Protein efficiency ratio (PER)

It was calculated using formula:
PER= Increment in body weight (g)/ Protein intake (g)

At the termination of the experiment, the surviving fish were counted and weighed individually and data were used for subsequent analysis using the computer programme 'Analyse it'.

RESULTS AND DISCUSSION

Silva and Anderson (1995) defined optimum ration size as the one giving the best growth and feed conversion ratio. Moreover, according to Cacho *et al*. (1990) maximum growth occurs at the limit of voluntary food intake (satiation); while maximum feed efficiency occur at some level below satiation. Based on the above mentioned definitions and statistical analysis of the results obtained, the optimum feeding level for *Tor putitora* fry having average initial weight 0.24±0.04g, attaining average final weight of 0.47±0.049g and fingerlings with average initial weight 4.27±0.02g, attaining average final weight of 5.75±0.032g under experimental conditions after a period of 60 days was found to be about 9% of body weight for fry stage (Table 4) and at 5% for fingerlings stage (Table 5). The growth performance of *Tor putitora* fed @ of 1%, 3%, 5%, 7%, 9% and 11% of body weight showed the following trend:

9%>11%>7%>5%>3%>1% (Fry stage)
7%>9%>5%>3%>1% (Fingerling stage)

The average values for specific growth rate (SGR) obtained at 9% and 11% feeding in fry were 1.14% and 1.05% and these values were close to each other (Table 4). However, the food conversion ratio (FCR) at 9% feeding level was better (6.59) than 11% feeding level (6.99), Table 4. Similarly, average value for specific growth rate (SGR) obtained at 5%, 7% and 9% in fingerlings are 0.497%, 0.488% and 0.473% respectively and these values were also close to each other (Table 5) while the food conversion ratio (FCR) fed at 5% feeding level was better i.e. 9.83 than 7% (9.96) and 9% (10.04) feeding level (Table 5). The present results get support from the findings of Seenapa *et al*. (1991) and Ranga Charyulu *et al*. (1991) who suggested 10% feeding level for catla fry and 5% level for fingerlings of *Labeo rohita* respectively. Silva *et*

al. (2007) suggested that the best feeding strategy for tambaqui during the first growth phase in cages is 10% BW/day divided in 3meals/day. The optimum ration level for the better growth, conversion efficiencies and body composition of fingerlings of *Heterpneustes fossilis* was found to be 5.9 - 6.8% of the BW day^{-1} as per Khan and Abidi (2008) .Contrary to present results, Nwanna (2003) obtained optimum feeding rate for *Oreochromis niloticus* at 3% body weight and the tendency for water quality deterioration with higher feeding rates. Ghulam *et al*. (2009) recommended a feeding level of 2.5% BW day^{-1} for juvenile *Lutjanus argentimaculatus*. Lin and Yi (2003) reported no significant difference in the yield of Nile tilapia fed at 50%, 75% and 100% of their body weights. Al Zahrani *et al.* (2013) found that final average body weight and weight gain of grouper fed the commercial diet at either 2,3 or 4% body weight were superior to that of fish fed at 1% bw.

Increase in specific growth rate (SGR) with higher feeding rates i.e. at 9% in fry and 5% in fingerlings during present studies suggests that perhaps large proportion of intake dietary nutrients have been utilized for fish growth apart from maintenance. On the other hand, the fish does not show any further increment in growth beyond 9% in fry and more than 5% in fingerlings. These results are similar to those of Kiran and Paulraj (1988) who also reported a linear increase in growth of the mullet, *Liza parisa* fry up to a feeding level of 8% and a disproportionately lower growth with further increase in feeding level. Das and Ray (1989) have also noticed a significant increase in weight gain and protein efficiency ratio in fingerlings of *Cirrhinus mrigala* at feeding levels ranging from 3% to 30% body weight and significantly lesser growth at 45% feeding level. During the experimental period of 60 days (June-August), the water temperature varied from 23ºC±1ºC 27ºC±1ºC, Water pH, 7.2 to 8.0, the free carbon dioxide was negligible and dissolved oxygen was 6.5-7.8 mg/lit.

Conclusion: The present study suggests 9% feeding level for fry and 5% for fingerlings to obtain optimum growth with less wastage of food and better economic returns in *Tor putitora* culture.

Acknowledgement: I would like to express my sincerest gratitude to Dr. P. Keshavanath, Director of Instruction (Fisheries) University of Agricultural Sciences, Bangalore College of Fisheries, Mangalore and Dr. Kuldip Kumar Sharma, Adviser cum Chief Executive Officer (Retd.), Bilaspur, H.P for their valuable suggestions and inspiration from time to time in the formulation of this work.

REFERENCES

Al Zahrani, A.W, A.H. Mohamed, A.E. Serrano and R.F.M. Traifalgar 2013. Effects of feeding rate and frequency on growth and feed utilization efficiency in the camouflage grouper (*Epinephelus polyphekadion*) fingerlings fed a commercial diet. European Journal of Experimental Biology 3(1) 596-601.

AOAC (Assoction of Official Analytical Chemists) 1995. Official Methods of Analysis. Assoc. Anal. Chem. Washington, DC, USA.

Cacho, J., U. Hatch and H. Kinnucan. 1990. Bioeconomic analysis of fish growth effects of dietary protein and ration size. Aquaculture**,** 88: 223-238.

Das, I. and A.K. Ray. 1989. Effect of different feeding levels on the growth performance of *Cirrhinus mrigala* (Ham.) fingerlings. Paper presented in the National Seminar on Forty years of Fresh water Aquaculture in India organized by Association of Aqua culturist and Central Institute of Fresh water Aquaculture 7-9, November, Bhubaneshwar, India (Abstract).

Goddard, S. 1996. Feed rations and Schedules, Feed management in Intensive aquaculture. New York, Chapman &Hall, 139-158.

Gulam, S. Siddiqui and J.A. Pirzada. 2009. Effect of different feeding level on the growth, feed efficiency and body composition of juvenile mangrove red snapper, *Lutjanus argentimaculatus* (Forsskal 1775). Aquaculture Research 40 (7):781-789(9).

Hasting, W.H. 1976. Fish nutrition and fish fed mixture. Paper presented at FAO Technical Conference on Aquaculture. (Kyoto Japan) FIR: Aq/conf/76/R.23. 13 pp.

Khan, M.A and S.F. Abidi. 2008. Optimum ration level for better growth, conversion efficiencies and body composition of fingerlings *Heterpneustes fossilis* (Bloch). Aquaculture International . DOI 10.1007/s10499-008-9234-2.

Kiran, V. and P.R. Paulraj. 1988. Food ration for rearing the fry of the mullet, *Liza parisa* 91-94. In M. Mohan Joseph (ed.) The first Indian fisheries forum. Asian Fisheries Society, India Branch, Mangalore.

Lin, C.W. and Y. Yi. 2003. Minimizing environmental impacts of freshwater aquaculture and reuse of pond effluents and mud. Aquaculture, 226: 57-68.

Nwanna, L.C. 2003. Risk management in aquaculture by controlled feeding Regimen. Pakistan Journal of Nutrition, 2(6): 324-328.

Pearson, D. 1976. The chemical analysis of food. Churchili, London. 574.

Ranga Charyulu, P.V., S. Sarkar, S.N. Mohanty, K.M. Das and Mukhopadhay. 1991. Growth and protein utilization in Rohu, Labeo rohita, under different feeding levels. Proc. Nat. Symp. Fresh Wat. Aqua. 95-97pp.

Seenappa, D. and K.V. Devaraj. 1991. Effect of feeding levels on food utilization and growth of catla fry. 49-54. In S.S. De Silva (ed.). Fish nutrition research in Asia. Proceedings of the Fourth Asian Fish Nutrition workshop. Asian Fish Soc. Spec. Pub., 5: 205, Asian Fisheries Society, Manila Phillipines.

Silva, S.S and T.A Anderson. 1995. Energetics. Fish Nutrition in aquaculture. London, Chapman and Hall. 15-25 pp.

Silva, C.R ; L.C. Gomes, and F.R. Brandao. 2007. Effect of feeding rate and frequency on tambaqui (*Colossoma macropomum*) growth, production and feeding costs during the first growth phases in cages. Aquaculture 264: 135-139.

Smith, R.R. 1975. Metabolizable energy of food stuffs for trout. Cornell Nutr. Conf. Vornell University, Ithaca, NY. 43-47 pp.

Viola, S. 1977. Energy values of feed stuffs for carp. Bamidgeh, 29: 29-30.

****