Indian Journal of
Animal Nutrition

EFFECT OF PELLETED FEED ON THE PERFORMANCE OF *Etroplus suratensis*

Debasis De*, T. K. Ghoshal, J. K. Sundaray, R. K. Chakraborti and S. A. Ali
Kakdwip Research Centre of CIBA, Kakdwip, South 24 Parganas, West Bengal-743347, India

(Received 9 May, 2006)

ABSTRACT

A 98 days feeding trial was conducted to assess the effect of different types of feeds on the growth of pearlspot (*Etroplus suratensis*) juveniles. 375 fish divided into 5 equal groups (3 replicates, each containing 25 fish) were offered feed either as pellets (P_1, P_2 or P_3) or mash (M) form. The 5th group (P_0) was not offered any feed. The mash was soaked in the water and was offered as dough. The body weight gain and average daily gain was higher ($P<0.01$) in P_2 as compared to that of P_3 which was significantly higher than that of P_1 whereas lowest in P_0 group. Final body length was higher ($P<0.01$) in P_2 than that of P_1, M and P_0 group. OM and CP digestibilities were low ($P<0.01$) in M as compared to other groups. EE digestibility and feed conversion ratio were high ($P<0.05$) in P_1 and P_2 groups as compared to that of P_3 and M groups. The result indicated that supplementation of feed was required for better growth of *Etroplus suratensis* and pellet form of feed was utilized efficiently than that of mash feed. Among the pellets, P_2 showed better performance than that of P_1 and P_3. ***(Indian J. Anim. Nutr., 2006, 23(2): 98-101)***

Key words: Feed formulation, Growth performance, Protein efficiency ratio, Digestibility, Pearlspot

The cichlid *Etroplus suratensis* (pearlspot) is a potential candidate for commercial aquaculture (Samarakoon,1985; Shiranee and Natarajan,1995) because of its high market demand. Commercial culture of pearlspot in different agro-climatic regions of India has been described by many workers (Jhingran and Natarajan,1972; Thampy,1980; Sumitra *et al.*,1981). Though this species is mostly cultured in Kerala but day-by-day this species is gaining popularity in other parts of India due to its good taste (Shiranee and Natarajan, 1995). The protein and essential amino acid requirements of pearlspot has been reporter earlier (Sumitra *et al.*, 1981; Pillai and Ali, 1997). There is an urgent need to develop a feed for *Etroplus suratensis* juveniles which can give faster growth keeping in mind specific requirement of the species. This study was conducted to develop complete feed for pearlspot juveniles with locally available ingredients.

*Corresponding author E-mail: debasisgtk@rediffmail.com

MATERIALS AND METHODS

Four types of feed were formulated for *Etroplus suratensis* (Pearlspot) using different locally available ingredients (Table 1). Pellets were prepared through extruder (94-103°C at 392-396 rpm roller speed). Size of pellet was 1x8 mm. 375 fish divided into 5 equal groups (3 replicates, each containing 25 fish) were offered feed either as pellets (P_1, P_2 or P_3) or mash (M) form. The 5th group (P_0) was not offered any feed. The mash was soaked in the water and was offered as dough. The fish were stocked per replicate in fibre reinforced plastic (FRP) tank containing 400 litres clear brackish water and were kept indoor for 98 days. The ingredient and chemical composition of different pellets and mash is given in Table 1. In the morning leftover

feed was siphoned out and 50% of water of rearing tank was changed. Temperature, dissolved oxygen, pH, salinity and alkalinity of the water of different tanks were measured (APHA, 1998) at weekly interval to assess the water quality in experimental tanks. A weighed quantity (3 to10% of body weight) of diet was distributed at 7 AM and 4 PM daily. The leftover feed was recovered, dried and subtracted from the feed offered for computing the feed consumed. Faeces were collected through siphoning with plastic pipe four hour after each feeding for consecutive seven days, washed gently with distilled water, dried in the oven at 60° C for 8h and collected for digestibility studies.

Table 1. Composition of different types of feed

	Pellet			Mash feed
	P_1	P_2	P_3	M
Ingredients composition, %				
Wheat flour	20	-	20	-
Maize flour	-	20	-	25
Rice bran	12	-	10	15
Wheat bran	-	11	-	-
Soybean meal	13	15	-	10
Mustard cake	15	20	19	25
Groundnut cake	15	-	15	-
Fish meal	19	25	27	19
Shrimp meal	4	7	7	4
Mineral mix.	1.5	1.5	1.5	2
Guar gum	0.5	0.5	0.5	0.5
Chemical composition, % DM basis				
OM	89.8	88.7	86.8	87.6
CP	32.2	33.3	34.5	30.0
CF	9.2	9.6	6.7	13.3
EE	5.7	5.1	4.0	3.9
Ash	10.2	11.3	13.2	12.4
GE (Kcal/g)	4.3	4.1	4.2	4.1

Soya oil was added @ 20 ml/kg in all pelleted feeds; Chromic oxide was added @ 0.5% in all the feeds

The feed and faecal sample were analyzed for the proximate components (AOAC, 1995) and chromium oxide content in faeces (Furukawa and Tsukahara, 1966). Feed samples were analysed for amino acid (Gardner and Miller, 1980). Water stability of pelleted feeds was determined (Immanuel *et al.*, 2003) by immersing wire gauge basket containing 2 g pellets in the glass jar containing brackishwater with continuous aeration by an aerator. The baskets were removed after 30, 60, 90 and 120 min and dried at 70°C.

The data were analysed by using simple ANOVA by GLM procedure of SPSS (1997).The method of least significant difference was applied for comparison between the treatments, following the method of Snedecor and Cochran (1973).

RESULTS AND DISCUSSION

The CP was highest in P_3 followed by P_2, P_1 and M feeds (Table 1). EE was highest in feed P_1 followed by P_2, P_3 and M feeds. GE was highest in feed P_1 and lowest in P_2 feed. Water stability of different types of pellet at different time interval was similar and after 2h immersion it was within the range of 75 to 85%. Temperature, dissolved oxygen, pH, salinity and alkalinity of the water of different tanks were within the normal range of 28.5-32.0°C, 5.2-9.2 ppm, 6.00-8.06, 16-20 ppt and 112-184 ppm, respectively (Shiranee and Natarajan, 1995). Amino acid analysis of the feeds (Table 2) revealed that all the feeds fulfilled most of the amino acid requirement of the species as described by Pillai and

Table 2. Amino acid composition of different feeds (% of feed as used basis)

Amino acids	Pellet			Mash feed
	P_1	P_2	P_3	M
Asparagine	2.01	2.30	1.98	2.15
Threonine	0.59	0.70	0.36	0.66
Serine	1.19	1.67	1.40	1.27
Glutamine	2.94	2.98	2.15	2.37
Glycine	1.59	1.41	1.76	1.89
Alanine	1.24	1.49	1.11	1.24
Cystine	0.04	0.00	0.00	0.03
Valine	0.84	0.99	1.19	0.90
Methionine	1.27	1.47	1.45	1.30
Isoleucine	1.79	1.60	1.48	1.59
Leucine	2.27	2.71	2.35	2.40
Tyrosine	0.89	0.89	0.59	0.70
Phenyl alanine	1.23	1.79	0.85	1.10
Histidine	0.60	0.74	0.71	0.47
Lysine	1.60	2.10	1.93	1.21
Arginine	2.20	3.39	2.50	2.09

Ali (1997) except lysine. However, the amino acid contents including lysine of different types of feed used in the present experiment conformed well with the amino acid requirement of Tilapia (Santiago and Lovell, 1988), Catla (Ravi and Devraj, 1991) and Trout (Ogino, 1980). The feed intake (g/d) was higher ($P<0.01$) in P_3 fed group (Table 3) as compared to that of P_1 and mash group but similar with that of pellet P_2 fed group. OM and CP digestibilities were higher in P_2 group when compared to P_1 and P_3, but the differences were nonsignificant. EE digestibility was higher ($P<0.05$) in P_1 and P_2 groups as compared to that of P_3 and mash fed group (Table 3). Feed conversion ratio(FCR) was lower ($P<0.01$) in P_1 and P_2 groups as compared to that of P_3 and mash fed group. Better digestibility of nutrients in P_2 group lead to better nutrient utilization and ultimately lead to low FCR. Protein efficiency ratio (PER) was higher ($P<0.01$) in P_1 and P_2 as compared to that of P_3 and mash group. Total body weight gain and average daily gain was higher ($P<0.01$) in P_2 group as compared to that of P_3 group which was higher ($P<0.01$) than that of P_1, mash and negative control group (Table 4). The higher PER, better FCR and better growth performance of fish fed P_2 might be due to better nutrient utilization, as reflected from digestibility of nutrients, and slightly better ($P>0.05$) amino acid profile of $P_{\%2}$ which correlated well with the requirements of many other fishes (Ogino, 1980; Santiago and Lovell, 1988; Ravi and Devraj, 1991; Pillai and Ali, 1997). Lysine content of mash was lower than that of P_1, P_2 and P_3 pellets because of less percentage of fish meal and soybean meal in mash as compared to pelleted feeds. Lysine is the most important amino acid for fast growth of any species and P_2 contained highest lysine among the experimental feeds, that's why fishes of P_2 fed group grew at a faster rate. Body weight after 98 days was found to be lowest in negative control group as fishes of this group were not supplemented with any feed, which indicates that for optimum growth performance of pearlspot supplementation of feed is essential. Average body length (mm) after 98 days was higher ($P<0.01$) in P_2 than that of P_1, mash and negative control group.

Table 3. Effect of different feeds on feed intake, digestibility of nutrients and feed conversion ratio

Parameter	P_1	P_2	P_3	M	Pooled SE
		Intake			
FI, g/d	0.06^a	0.10^{bc}	0.11^c	0.09^b	0.04
TF, g	6.2^a	10.2^{bc}	11.1^c	8.9^b	0.6
FCR	4.2^a	3.9^a	5.3^b	6.4^b	0.3
PER	0.8^b	0.8^b	0.6^a	0.5^a	0.01
		Digestibility, %			
DM	92.3	92.1	92.7	93.2	0.6
OM	70.1^{ab}	74.7^b	71.8^{ab}	65.4^a	2.1
CP	77.5^{ab}	84.2^b	82.1^b	74.0^a	2.3
CF	28.5^a	38.9^{ab}	33.2^a	48.8^b	3.6
EE	88.3^b	89.7^b	77.9^a	80.8^a	1.5

Figures with different superscripts in a row differ significantly, $P<0.05$

Table 4. Growth performance of *Etroplus suratensis* fed different types of feed

Parameter	P_1	P_2	P_3	M	P_0	Pooled SE
			Body weight, g			
Initial	0.3^a	0.3^a	0.3^a	0.4^{ab}	0.4^b	0.1
Final	1.8^a	2.9^c	2.4^b	1.8^a	1.6^a	0.6
Gain	1.5^b	2.6^d	2.1^c	1.4^{ab}	1.1^a	0.6
Gain (mg/d)	15.2^b	26.5^d	21.3^c	14.3^{ab}	11.5^a	6.1
			Body length, mm			
Initial	24.7	25.1	25.1	25.5	26.3	0.6
Final	45.5^{ab}	52.6^c	49.3^{bc}	45.5^{ab}	42.9^a	3.8

Figures with different superscripts in a row differ significantly, $P<0.05$.

The result indicated that supplementation of feed is essential for better growth of *Etroplus suratensis* and pellet form of feed is utilized efficiently than that of mash feed. Among the pellets, P_2 showed better performance than that of P_3 and P_1 which suggested that amino acid content and profile may play an important role in growth performance of *Etroplus suratensis*.

ACKNOWLEDGEMENT

The authors acknowledge Director, CIBA, Chennai for providing necessary facilities to con-

duct the experiment. Authors are grateful to Dr. J. Syamdayal, CIBA and Dr. K. Ambashankar, CIBA for their assistance during chemical analysis of sample at Nutrition laboratory, CIBA, Chennai.

REFERENCES

AOAC. (1995) *Official Methods of Analysis*. 16th edn., Association of Official Analytical Chemists, Arlington, Virginia, USA.

APHA. (1998) *Standard Methods for the Examination of Water and Wastewater*, American Public Health Association., Washinton D.C.

Furukawa, A. and Tsukahara, H. (1966) On the acid digestion method for the determination of chromic oxide as an index substance in the study of digestibility of fish feeds. *Bull. Japan. Soc. Sci. Fish.*, **32**: 502-506.

Gardner, W.S. and Miller, W.H. (1980) Reverse-phase liquid chromatography of amino acids after reaction with Ophthalaldehyde. *Anal. Biochem.*, **101**: 61-70.

Immanuel, G., Menenthira, V., Beena, S. and Palavesam, A. (2003) Effect of probionts on the growth, food utilization and biochemical changes in pearl spot *Etroplus suratensis* (Bloch). *Indian J. Fish.*, **50**: 273-278.

Jhingran, V.G. and Natarajan, A.V. (1972) Role of Chilka Lake fisheries in the development of coastal aquaculture in eastern India. In: *Coastal Aquaculture in the Indo-Pacific Region* (edn. T.V.R. Pillay), pp. 109-115. Fishing News Books Ltd., London.

Ogino, C. (1980) Requirement of carp and rainbow trout for essential amino acids. *Bull. Japan. Soc. Sci. Fish.*, **46**: 171-174.

Pillai, S.M. and Ali, S.A.(1997) Preliminary studies on the essential amino acid requirements of the Pearlspot, *Etroplus suratensis*. *Asian Fisheries Science*, **9**: 289-294.

Ravi, J. and Devaraj, K.V. (1991) Quantitative amino acid requirements for growth of catla, *Catla catla* (Hamilton). *Aquaculture*, **96**: 281-292.

Samarakoon, J. I. (1985) Experimental seed production in *Etroplus suratensis* by induced pair formation and breeding through environmental manipulation. *Aquaculture*, **46**: 323-332.

Santiago, C.B. and Lovell, R.T. (1988) Amino acid requirements for growth of Nile tilapia. *J. Nutr.*, **118**: 1540-1546.

Shiranee, P. and Natarajan, P. (1995) Impact of compounded feeds on the growth, muscle composition and organoleptic characteristics of pearlspot *Etroplus suratensis* (Bloch). *J. Aqua. Trop.*, **10**: 231-243.

Snedecor, G.W. and Cochran W.G. (1973) *Statistical Methods*. 6th edn., Iowa state University, Iowa, 593 p.

SPSS. (1997) *Base Application Guide* 7.5, Statistical Package for Social Science, USA.

Sumitra, V., Krishnakumari, L., Gopinath, V.G. and Dhawan, R.M. (1981) Aquaculture of Pearlspot *(Etroplus suratensis)* in an estuarine pond: environmental characteristics, primary production, growth and cost-benefit ratio. *Ind. J. Marine Sci.*, **10**: 82-89.

Thampy, D.M. (1980) Culture of *Etroplus suratensis* (Bloch). In: *Summer Institute on Brackishwater Capture and Culture Fisheries*. Central Inland Fisheries Research Institute, Barrackpore, W.B., p 6.