Observation on feed conversion efficiency and growth of Schizothorax niger at Beerwa Spring Kashmir

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Abstract
Schizothorax niger was reared under artificial conditions at Beerwa spring Budgam. Around sixty specimens were taken for current research programme. The fishes were reared for a period of twelve months on artificial diet. The results observed indicated that the standard deviation of growth observed under control, feed first, feed second and at feed third is 9.567, 13.00, 1.45 and 14.06 respectively. Whereas the P- value observed is 0.0015 considered very significant. The standard deviation for feed conversion efficiency observed at control, feed first, feed second and at feed third is 48.36,63.66,61.58 and 63.98.The P- value is <0.0001,considered extremely significant.
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Introduction

Food is considered as an important ecological factor influencing the population dynamics of fishes. One of the essential prerequisites for the successful management of fish culture programmed is a comprehensive understanding of feeding. The increase in cost and demand of feed protein from conventional resources necessitates fish culturists of the developing countries to incorporate cheap and locally available ingredients in fish feeds. Recently the utilization of aquatic plants having high food value are used to supplement fish food has taken a new dimension for producing the much required animal protein at low cost. Fish requires diet relatively higher in protein than those of commercially cultured animals. As protein represents the most expensive component in a formulated diet. It is considerable practical importance to determine the optimum level that will support maximum growth and survival**.**

Nutrients essential to fish are the same as those required by most animals ,these include water proteins, (amino acids), lipids (fats, oils, fatty acids), carbohydrates (sugars, starch), vitamins, and minerals. In addition pigments (carotenoids) are commonly added to the diet of salmonid and ornamental aquarium fishes to enhance their flesh and skin coloration respectively. In their natural environment fish have developed a wide variety of feeding specialization (behavioral, morphological, and physiological) to acquire essential nutrients and utilize varied food sources. Based on their preference to diet fishes are classified as carnivorous (consuming largely as animal material) herbivorous (consuming primarily on both plant and animal material). However, regardless of their feeding classification in captivity fish can be taught to readily accept various prepared foods which contain the necessary nutrients.

Materials and Methods

Diet formulation (Singh *et.al.*, 1987; Siddiqui (1988): Alhafedh (1999) Stickney (2000) Jena (2006) Korkut (1999)

Ingredients

The ingredients were dried and grinded to powder form. The proximate composition of three ingredients is shown in table below. After acclimatization six fingerlings were randomly transferred to each aquarium. The average initial body weight of fingerlings was 60g. The feed was applied at the rate of 4% of body weight of the fingerlings throughout the experiment of two years.

Chemical composition of three ingredients

Group	Fish meal	Soya meal	Mustard cake	Wheat bran	Rice bran
Group 1	50%	23%	11%	9%	7%
Group 2	40%	33%	7%	9%	11%
Group 3	30%	43%	9%	7%	11%
Control	*	*	*	*	*

GROWTH Lecren (1965):Singhet.al.,(1987):Husset.al.,2007,Alfahedh 1999: Sampath 2003:Aras 2000**:**

The growth rate of S.esocinus were measured by the formula:

$$\text{Specific growth rate (SGR)} = \frac{\text{in last weight (g)} - \text{in first weight (g)}}{\text{Cultivation period (day)}}$$

Feed Conversion Efficiency Takeda (1975): Spinelli (1985): Cho and Kaushik (1990): Appelbaum (2002); Okeoyo (2007)

The FCR for each treatment was computed by the following equation.

FCR = F / WF – WO), where

F = is the weight of food supplied to fish during the study period.

WO = is the live weight of fish at the beginning of the study period.

WF =is the live weight of fish at the end of the study period.

Results and Discussion: The results indicated that the mean growth rate under controlled condition is 156.375.At feed first it is 201.3, at feed second it is 20.1, where as at feed third it is 217.2.The standard deviation observed under controlled condition is 46.8, at feed first it is 20.3,at feed second it is 60.9,and at feed third it is 68.8.The detailed account observed is given at table (a). The P- value is 0.0015 considered very significant.Variation among column means is significantly greater than expected.

Table (a) showing variation of different feed on growth of S.niger

Parameter	Control		Feed Ist		Feed 2nd		Feed 3rd	
	S.niger Initial	S niger final.	S.niger Initial	S niger final.	S.niger Initial	S.niger final.	S.niger Initial	S niger final.
Mean	150.875	156.375	185.5	201.3	178.5	20.1	186.8	217.2
Standard deviation	45.7	46.8	65.1	63.6	60.8	60.9	59.2	68.8
Standard error of mean	9.348	9.567	13.290	13.00	12.43	12.45	12.09	14.06
Normality test(P-value)	>0.10	>0.10	>0.08	>0.10	>0.10	>0.10	>0.10	>0.10
Passed Normality test.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

The results indicated that the mean feed conversion efficiency under controlled condition is 48.36 and standard deviation 48.36 .The mean at feed first is 201.58 and standard deviation 63.66, where as the mean at feed second was 199.95 and standard deviation 61.58 and at feed third was 221.45 and standard deviation 63.98.The detailed account of results observed are given at table (b). The P-value observed is <0.0001, considered extremely significant. Variation among column means is significantly greater then expected.

Table (b) Showing variation of different feed on Feed conversion efficiency of S.niger.

Parameter	Control	Feed Ist		Feed 2nd		Feed 3rd	
	S niger final.	S.niger Initial	S niger final.	S.niger Initial	S.niger final.	S.niger Initial	S niger final.
Mean	155.04	21	201.58	21	199.95	21	221.45
Standard deviation	48.36	6.85	63.66	6.85	61.58	6.85	63.98
Standard error of mean	9.87	1.39	12.99	1.39	12.84	1.39	13.06
Normality test(P-value)	>0.10	0.07	>0.10	0.07	>0.10	0.07	>0.10
Passed Normality test.	yes	yes	yes	yes	yes	yes	yes

The assessment of biological parameters can be considered as a diagnostic tool to determine the nutritive value of the fish, available information in the feeding plant diet by omnivorous fish revealed that the individuals are incapable of consuming enough plant diet to exhibit growth to support maintenance and even resulted in the loss of body tissue. This may be due to the presence of higher amount of carbohydrate present in the plant diet. Diet of schizothorax richardsonii comprises 75% plant matter and 25% of animal matter (Mir 1986) Lovell (1989) worked out comparable to fish meal; rice bran contains thrice the level of amino acids. Webster (1995) found that in channel catfish distiller's grain with soluble (DGS) and Soya bean meal totally replaced fish meal in the diet without reducing weight grain and feed conversion efficiency. Better growth performance in carps fed on a diet containing brewery waste has been attributed to the availability of good quality protein as the waste contains essential amino acids like lysine, arginine, and methionine. William (1995) observed maximum weight gain in fish fed on a diet containing 35% corn DGS. However, the maximum protein efficiency ratio was recorded in fish fed on a diet containing 49% DGS with synthetic lysine and tryptophan Wu et al, (1997). Arthur (1976) observed that the composition of the diet of the majority of marine fish larvae which consume copepod nauplii at different frequencies because of their great abundance in the environment as well as their appropriate size as food for fish larvae. Callionymus species larvae eat significantly larger prey than the A. laterna larvae, could be related to their morphology especially the mouth size, which functions as a filter to determine prey size (Chao and Musick, 1977). Appelbaum (2007) reported cannibalism was the main cause of mortality and was responsible for losses of up to 28% after 45 days. This study confirmed that the experimental dry feed was a good starter feed which may satisfy the nutritional requirements of the larvae. Fishes regulate feed intake to satisfy their energy requirements. High feeding rate and frequent feeding lead to the good performance (Stickney, 1994) Wu et al. (1997) observed that maximum weight gain in fish fed on a diet containing 35% DGS. However, the maximum protein efficiency ratio was recorded in fish fed on a diet containing 49% DGS with synthetic lysine and tryptophan. Desche and Anderson (1995) studied that fishes fed to satiation do not eat again until stomach is almost completely evacuated.Salim and Sheri (1999) reported 4% feeding/kg body weight. Social interaction and dominance hierarchy formation can lead to suppression of food intake and growth in subordinate individuals. (McCarthy et al., 1992). Garcia et al. (1994) reported that both the effects of DP (digestible protein) and DE (digestible energy) were shown to vary significantly depending on the size of mullaray, on a relative basis the demand for protein for somatic growth is known to be greater for smaller than larger fish and conversely the demand for energy is greater for larger than smaller fish. Khan (1996) observed that the omnivorous fishes do not show marked seasonal variation in feeding activity due to availability of one kind of fish or the other throughout the year. Oreochromus niloticus fry feed on a practical diet containing 40% protein shows significant growth (Alhafedh, 1999). Diets containing excessive protein will generally be less cost effective and produce excessive nitrogenous wastes. Xic et al. (2001) worked out that digestible energy content for smaller, rapidly growing fish, large mullaray is consumed relatively more lower energy diet (compared with HE diet), than small fish presumably to meet a greater demand for metabolic energy. However, the greater overall relative feed intake demonstrated by large mullaway was likely compensatory as indicated by the initial body composition. Nanton (2007) worked out that diets containing excessive protein will generally be less cost effective and produce excessive nitrogenous wastes. Diets with excessive lipid content will increase lipid deposition. To the visceral cavity, liver and muscle tissues of fish. Getabu (1987) reported that young of clitherus fed on zooplankton. High feeding incidence of callionymus species larvae can be associated with a looped gut which reduces the amount of regurgitation on capture as in other perciform species (Arthur 1976). Composition of the diet of the majority of marine fish larvae which consume copepod nauplii at different frequencies because of their great abundance in the environment as well as their appropriate size as food for fish larvae. Appelbaum (2002) an increase of feeding level lead to increase of food conversion ratio but with rather the slight increase of specific growth rate. While dry diets promoted higher growth rate than live artemia nauplii alone a combination of the two resulted in the fastest growth. Appellbaum (2007) reported that cannibalism was the main cause of mortality and was responsible for losses of up to 28% after 45 days. This study confirmed that the experimental dry feed was a good starter feed which may satisfy the nutritional requirements of the larvae. Diets with excessive lipid content will increase lipid

deposition to the visceral cavity, liver and muscle tissues of fish (Nanton 2007). Mir (1986) reported that schizothorax diet comprises 75% plant matter and 25% of animal matter. Hepatosomatic index should be three or below in fish feeding and above values indicate low quality of feed and therefore high level of carbohydrate. (Getankaya 1989) reported that trichopterans and nematodes as parts of the components found in the stomach of species larvae Bankole (1989 observed comparable to fish meal rice bran contains thrice aminoacids. Peturdotter (2002) worked out that there were significant differences between feeding in Arctic charr and Helibut. Najia (2003) worked out that crude protein contents in wheat bran used in the present study was comparatively higher (14.52%) than the wheat bran (13.81%) used for Cirrhinus mrigale. Shabir et al (2003) reported that weight gained by hybrids on wheat bran (1.60±0.14g) was higher than Cirrhinus mrigale which gained 0.19±0.2g weight on wheat bran. Labeo rohita gained 2.63±0.45g body weight on sunflower meal which is higher than the weight gained by hybrids(1.62±0.05) (Ali and Salim 2004). Diets with excessive lipid content with increase lipid deposition to the visceral cavity liver and muscle tissue of fish. (Nanton, 2007).

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