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Growth Performance and Cost Benefit Analysis of *Clarias Gariepinus* Fed with Different Commercial and Compounded Feeds

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Abstract

Growth performance of *Clarias.gariepinus* fry fed with different feeds were carried out at the Department of Fisheries Modibbo Adama University of Technology Yola, Adamawa State Laboratory. The four different feeds were used. Coppens (56%), Multifeeds (45%) and locally compounded feeds of (35%) and (45%) Crude Protein levels respectively. Each fish feed was in triplicate and fifteen fry were stocked in plastic bowls of 40cm x 30cm dimensions. The results obtained indicated an increase in growth parameters for the four treatments. Fry fed with Coppens and Multi-feeds recorded the highest value in the final mean weight (FMW), feed conversion ratio (FCR), protein intake (PI), feed intake (FI) but the two compounded feeds had the least value for specific growth rate (SGR), while there was no significant difference in survival rate from the four treatments. Multi-feeds had the best cost benefit, followed by Coppens and compounded feeds respectively.

Keywords: Growth, survival, fish feeds, cost benefit, *Clarias* fry.

INTRODUCTION

Fish seed production efficiency of many fish farms hatcheries throughout Nigeria as well as other developing countries of the world is mostly hindered by poor nutrition. Fish which is known to have high quality protein that can be as high as 60% on dry matter basis are concern to many. Lack of good quality feed for economic production adversely affects growth rates, disease manifestation and survival rate of fish.

Intensively cultured fish usually require high protein feeds and since feeds are normally the largest variable cost items in commercial production, the profitability of intensive aquaculture is closely related to the world supply and cost of food protein. Generally, increasing protein levels in fish diets can lead to improved fish production, though it may be expensive. However, protein requirement for maximum growth of any species of fish is a step forward in developing cost effective feed for fish farming and this has to do with determining the optimum amount required to produce maximum growth rate.

Dietary protein requirement of African catfish have been reported by several authors. Jamabo and Alfred-Ockiya reported 40% crude protein for *H.bidorsalis*, while Fagbenro et al reported 42.5% dietary protein for *H.longifilis*, hence the need for the research on different protein levels and type of feeds survival and growth of Clariids.

Protein is the most expensive component in supplementary fish feed production. Whereas, feed constitutes 60-70% of total investment in aquaculture. Any reduction in dietary protein level without affecting fish growth can substantially reduce the cost of fish. However, most of the commercial fish feeds in Northeastern part of Nigeria were imported from Europe and Asia. These feeds are very expensive due to high cost of importation and transport to the region especially Adamawa state, though use of live food has been successful but seems to be labour intensive and requires vast space for rearing which could also be expensive.

Table 1. Feed Composition of Compounded Diets and Their Proximate Analysis

Feed ingredients	**35% C.P**	**45% C.P**
Fishmeal	15.0	20.9
Soyabean meal	13.3	23.2
GNC	8.8	15.5
Maize	54.8	32.9
Salt	0.5	0.5
Bone meal	0.5	0.5
Lysine	1.0	1.0
Vitamin C	1.0	1.0
Groundnut oil	0.5	0.5
Calculated Crude protein levels	35% C.P	45% C.P
Analyzed Crude protein levels	33.43	44.04
Lipid	9.46	11.52
Crude fibre	7.00	11.50
Ash	1.50	1.80
Proximate Composition of Commercial Feeds		
Feed type	**Coppens**	**Multifeeds**
Analysed protein levels	56% C.P	45% C. P
Fat	15	12
Calcium	2.6	2.2
Phosphorus	1.8	1.2
Sodium	0.7	
Ash	10.9	8.5
Fibre	0.4	2.5
Vitamin A	22.500 Lu mg/kg	10.000 lu mg/kg
C	300 mg/kg	100mg/kg
D3	2500mg/kg	
E	200mg/kg	200mg/kg
Preservatives/ Antioxidant	E280, E324,F324	

MATERIALS AND METHODS

Study area

The research was carried out at the fisheries laboratory, Federal University of Technology Yola, to take advantage of some materials available at the laboratory such as weighing balance, pH Meter, Thermometer and source of water supply.

Collection of Fry

180 fry were collected from the Federal Department of Fisheries Yola Field Office and transported to the Department of Fisheries, Modibbo Adama University of Technology Laboratory. The experimental fish were acclimatized for two weeks. The initial weight of the fry as well as the total length were recorded and stocked in their respective plastic bowls. The procedure involves weighing 15 fry for each of the 12 bowls used for the experiment, while the initial lengths of 3 fry are taken at random using a ruler.

Feeding frequency

Feeding was given to the fry twice a day, which is 9 AM and 5 PM for six weeks at 5% of their total body weight with aeration.

Table 2. Proximate Composition of Commercial Feeds

FEED TYPE	COPPENS	MULTIFEEDS
ANALYSED PROTEIN LEVELS	56% C.P	45% C. P
Fat	15	12
Calcium	2.6	2.2
Phosphorus	1.8	1.2
Sodium	0.7	
Ash	10.9	8.5
Fibre	0.4	2.5
Vitamin A	22.500 Lu mg/kg	10.000 lu mg/kg
C	300 mg/kg	100mg/kg
D3	2500mg/kg	
E	200mg/kg	200mg/kg
Preservatives/ Antioxidant	E280, E324,F324	

Water quality management

Physiochemical parameters were taken daily i.e. pH, temperature and dissolved Oxygen of the water.
Dead fry and uneaten food were siphoned daily and water increased to the usual level before feeding the fish. The culture system was aerated battery-powered aerators.
Parameters determined were:

$$\% \text{ Survival rate (\%SR)} = \frac{\text{Final number of fish}}{\text{Initial number of fish}} \times 100$$

$$\text{Specific growth rate (SGR)} = \frac{\ln W_2 - \ln W_1}{T} \times 100$$

Where; W_2 = Final Average Weight (g)
W_1 = Initial body Weight (g)
Ln = Natural Log
T = Duration of the study in days

$$\text{Condition factor (K)} = \frac{W_2}{L^3_2} \times 100$$

$$\text{Feed Conversion Ratio (FCR)} = \frac{\text{Weight of dry feed fed (g)}}{\text{Live Weight gain of fish (g)}} \times 100$$

Feed intake (FI) = feed consumed X average body weight

$$\text{Protein efficiency ratio (PER)} = \frac{\text{Gain in Weight (g)}}{\text{Protein consumed (g)}}$$

RESULTS

The result of the growth of *C. gariepinus* fed different types of feed showed significant increase in length and weight of the fry fed with each of the experimental diets. The least value existed between the fry fed compounded feeds of 35% and 45% Crude protein, while the highest values were recorded in fry fed Coppens and Multifeeds (Table 2).

The result indicated that growth parameters are higher in fry fed Coppens and Multifeeds with no significant difference between them ($p< 0.05$).For example, fry fed Multifeeds and Coppens recorded the highest value for length compare to those fry fed Compoundedfeeds. Fry fed Multifeeds had the highest final mean weight(FMW) of 4.76g and Coppens 4.20g. However, fry fed Coppens had the highest Specific Growth Rate (SGR %) per day. There was significant difference ($p< 0.05$)in the protein intake (Pl) between the Multifeeds and Coppens, but their rate of survival in the two feeds were the same.

The growth rate for fry fed Compounded feeds (35% Cp and 45% Cp) showed no significant difference between them in Feed intake (FI), Final length(FL), and Mean weight growth(MWG) but differed significantly ($p< 0.05$) in Protein efficiency rate(PER) and condition factor (K). There was also significant difference between the fry fed Compounded

Table 3. Growth Parameters of Fry fed Different Feeds

Parameter	35% C.P	45% C.P	Coppens	Multifeeds
IMW [g]	0.57	0.59	0.53	0.56
FMW[g]	1.03^{c}	0.90^{c}	4.20^{a}	4.76^{b}
MWG [g]	0.46^{b}	0.31^{b}	3.67^{a}	4.20^{a}
IL [cm]	4.1^{a}	3.8^{a}	4.1^{a}	3.9^{a}
FL[cm]	5.5^{b}	5.5^{b}	8.3^{a}	8.8^{a}
SGR [%/day]	0.61^{c}	0.44^{c}	0.82^{a}	1.01^{b}
CF (K_1)	1.2^{a}	0.9^{a}	0.9^{a}	1.1^{a}
CF (K_2)	1.6^{b}	1.9^{a}	1.4^{c}	1.4^{c}
FI (g)	1.10^{c}	0.74^{c}	22.70^{a}	22.10^{b}
PI (g/fish)	2.0^{b}	2.6^{b}	7.2^{a}	5.6^{a}
PER	0.02^{b}	0.03^{b}	0.09^{a}	0.09^{a}
SD	45	45	45	45
FNF	18	15	17	17
% Survival	40^{a}	35^{a}	37^{a}	37^{a}

NOTE: Means with same letter is not significantly difference
KEYS= Final mean weight (FMW), Specific growth rate (SGR), Mean weight gain (MWG), Feed intake (FI), Protein efficiency ratio (PER), final length (FI),Stocking density (SD), Final number of fish (FNF).

Table 4. Cost –Benefit Analysis for the Different Feeds Compounded feeds

FEED INGREDENTS	35% C.P	PRICE (N)/kg	45% C.P	PRICE(N)/kg
Fish meals	15.0	75	20.9	90
Bone meal	0.5	40	0.5	120
Soya bean meal	13.3	80	23.2	40
Maize	54.8	120	32.9	70
Salt	0.5	5	0.5	5
GNC	8.8	70	15.5	130
Lysine	1.0	40	1.0	40
Vitamin C	1.0	60	1.0	60
G.Nut oil	0.5	80	0.5	80
TOTAL		N570		N645
Final number of fish	18	15	17	17
% Survival	40^{a}	35^{a}	37^{a}	37^{a}

NOTE: Means with same letter is not significantly difference ($p>0.05$)

Commercial feeds
Coppens= #22,000.00/20kg/bag #1,400/kg
Multifeeds = #4,500/kg/bag #400/kg
Feed intake
Coppens =22.70 #1.4/g =N31.78k
Multifeeds =22.10g 40kobo/g =N8.84k
45% C.P =0.74g 57kobo/g =42k
35% C.P =1.1g 65kobo/g =72k

feeds and Commercial feeds. From the results obtained fry fed 35% CP had the least PER value, while the highest value was recorded by fry fed Multifeeds, but significantly different with fry fed Coppens

Discussion

The increase in growth rate and feeds utilization was high in fry fed Coppens and Multifeeds with significant difference (P> 0.05). Whereas those fed Compounded feeds had the least value for SGR (%/day), but there was no significant difference between them. Multifeeds which contain 45% CP performed better than the compounded feeds of 44.04% analyzed crude protein formulated from locally available ingredient in the open market. This might be possible due to lack of some essential and non-essential minerals in the compounded feeds such as sodium, phosphorous, calcium, attractants as well as Vitamins.

In terms of condition factors, fry fed Coppens and Multifeeds showed no significant difference ($p<0.05$), while those fed 45% C.P compounded feeds had the highest value. This implied that the fry were in healthy condition throughout the experiment. The value recorded for fry feed 45% C.P in this study is similar to those obtained in Diyaware *et al* (2009) that studied the effect of different dietary protein on growth performance and feed utilization of hybrid catfish. The authors discovered that fry fed 45% CP had condition factor 1.90 at the end of their experiment.

The survival rate obtained in this study revealed that fry fed Coppens and Multifeeds are virtually the same. Furthermore, the survival rate obtained for the whole treatment showed no significant difference ($p<0.05$). The problem associated with the low survival rate in this study arose due to the change in the physio-chemical parameters of the water; the water was treated with chlorine from the source of water supply used for the culture without notification. Moreover, it was observed that the fry showed erratic movements and loss of appetite in the 4th and 5th week of the study, and then 20g of Vitamin C was incorporated in their feed and Tetracycline capsule in the water after recording a lot of mortalities as a result of swollen stomach and loss of appetite. However, the result obtained from this study for survival rate is similar to the findings of Ataguba *et al* (2010) on the growth performance of two African Catfish, of which the purebreds recorded 37.8% and 38.75% for pure crossbred *C.gariepinus* and *H.longifilis* respectively.

The highest value for protein intake is recorded in fry fed Coppens and Multifeeds, while the least value was recorded in fry fed 45% CP. The result obtained for average mean weight gain and weekly average length gain followed the same pattern also.

Conclusion

From the result of this study, it was noticed that Multifeeds which contains 45% CPhad better performancethan its counterpart formulated from locally available ingredients. Multifeeds compared favourably to Coppens (56%CP). The costly-benefit analysis indicated that Coppens which cost ₦1400/kg (i.e. ₦ 1.4/g of feed) was more expensive than Multifeeds that cost ₦400/kg (40k/g of feed).Multifeeds had the best cost-benefitamong the fish feeds in the experiment. It is however noticed that to raise 45 fry to fingerling stage by feeding them Coppens will cost you about ₦32, while feeding them on Multifeeds will cost ₦ 9. Feeding fry on Compounded diet is also cheaper (57-63 Kobo) but will take longer period before a fry will reach fingerlings stage. Furthermore, it is observed that the price of fingerlings at most of the fish farms in Yola , Adamawa State is ₦ 30. Therefore, the use of Coppens as fry feeds can be substituted with Multifeeds so as to reduce the cost of production by more than 50% and to maximize profit, although the use of Multifeeds requires a lot of effort to grind and sieve to a reasonable diameter for feeding fry, because the available stock in the open market ranges from 2mm and above.

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