EFFECT OF SOURCES OF FISHMEAL ON THE PERFORMANCE OF GROWING CATFISH

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ABSTRACT
A study on the effects of three sources of fish meal on the performance of growing catfish was carried out. Maiduguri fishmeal. Imported fishmeal of 72% CP and fish crumbs obtained from the local market in Kaduna were used in this study. There were four dietary treatments based on the three sources of fishmeal in the diets and a foreign complete fish feed (coppens) serving as the control. Each diet was replicated three times. A total of 288 growing juveniles were randomly assigned to four treatments of 72 fish per treatment and 24 per replicate in a completely randomised design in an experiment that lasted eight weeks. The growth performance data include feed intake, body weight, feed conversion ratio and feed cost per kg gain were obtained. Data collected was subjected to one-way ANOVA where significant means were separated using Duncan multiple range test. The result showed that coppens had significantly ($p<0.05$) higher final body weight and weight gain while fish crumb recorded the least. Feed intake was not significantly ($p>0.05$) influenced by the sources of fishmeal. Feed conversion ratio was better for coppens (1.10) followed by Maiduguri fishmeal (1.43), Imported fishmeal (3.93) while fish crumb did poorly (16.82). However, feed cost per kg gain of Maiduguri fish was significantly lower($p<0.05$) compared to all the other treatments. Maiduguri fishmeal resulted in 49% savings in feed cost per kg gain. In conclusion, Maiduguri fishmeal was the best source of fish meal for the manufacture of sinking pellets for local catfish feeding.
Keywords: Growth Performance, Fishmeal diet, *Clarias gariepinus*, Fish

INTRODUCTION

Aquaculture is an important food production sector for meeting global food and nutrition security needs to curb the challenges of hunger and malnutrition (Langi et al., 2024). Feeds used in aquaculture are designed to satisfy the dietary requirements of fish species while ensuring the ratio of protein, carbs, and fats (Geay & Kestemont, 2015). The optimal balance in nutrients does not only depends on the fish species but also on its life stages (The Fish Site, 2007). Feeds must be nutritionally complete as the fish do not get supplementary nutrients from nature in intensive aquaculture systems.

The rearing of catfish is widely practiced in the Far East and is gaining popularity in Africa. The most important culture species are *Clarias* and *Heterobronchus* species (Gietema, 2015). Though, one of the most important farming programme in the world, fish farming tends to be influenced by the change in prices of feed ingredients, thus leading to increased cost of production when there is hike in the prices. According to Wang et al. (2023), the most expensive nutrient to supply in fish feeds is the protein. Carnivore species tend to have higher protein requirements than the omnivores or the herbivores and are more expensive to feed. Generally, fish diets tend to be very high in protein. One major dietary component that limits growth of fish is the protein and within the same species, protein requirement varies with size, age, water temperature, salinity, protein quality, daily feed allowance and culture system (Bowen, 2014).

MATERIALS AND METHODS

This experiment was carried out at the backyard of a private residence within ABU Staff Quarters, Samaru Zaria, Kaduna State, Nigeria (between latitude 11^0 06' N and longitude 7^0 43'N). A total of 288 catfish Juveniles (*Clarias gariepinus*) at the age of 7 weeks purchased from the fisheries department of the National Agricultural and Extension Research Liaison Services A.B.U. Zaria were used for the feeding trial. For acclimatisation, they were fed imported floating fish feed (coppens) for two weeks from the date of collection before the commencement of the experiment. The fishes were raised in a wooden box structure. There were four dietary treatments and each treatment was divided into three replicates of 24 Juveniles catfish. Feeding was carried out twice daily at 9:00am and 4:00pm respectively. Fish feed were compounded to include 15% of each fishmeal sources.

There were three rows of long boxes. Each box was divided into 4 compartments with each compartment measuring 70cm wide, 70cm long and 110cm deep. Each of the 12 compartments contained 24 juvenilesof equal mean weights at the commencement of the feeding trial. Prior to the commencement of the experiment, the constructed wooden box compartments were tightly lined with green coloured soft lanolin carpet to prevent

water leakage before filling with water and stocking each box with the juveniles. The feeding trial lasted for six weeks.

There were four diets. Each diet was replicated three times. The compositions of the three diets formulated and tested along with coppens (foreign fish feed) floating fish feed. The fishmeal was analysed to ascertain their chemical compositions according to the AOAC (1980).

All data collected were subjected to one-way ANOVA using Minitab 14 statistical software where significant means were separated using the Duncan's Multiple Range Test (DMRT) (Steel and Torrie, 1990).

Table 1: Composition of Experimental Diets

Ingredients	72% CP imported fishmeal	Maiduguri fish	Fish crumbs	Coppens
Maize	17.69	9.73	7.23	
Wheat (whole)	5.00	5.00	5.00	
Cassava	5.00	5.00	5.00	
Groundnut Cake 44%	33.70	41.30	43.76	
Soya Cake	20.00	20.00	20.00	
Fish Meal (72%)	15.00	-	-	
Maiduguri Fish	-	15.00	-	
Fish Crumbs	-	-	15.00	
Oil Sludge	0.50	0.50	0.50	
Bone Meal	1.20	1.20	1.20	
Salt	0.15	0.15	0.15	
Catfish Premix **	0.50	0.50	0.50	
L-Lysine	0.13	0.49	0.53	
DL-Methionine	0.12	0.12	0.12	
Enzyme	0.01	0.01	0.01	
Total	100.00	100.00	100.00	
Calc. Analysis				
%oCP	37.00	37.00	37.00	42.00
ME: Kcal/kg	2729	2595	2567	N/A
E: Prot. Ratio	73.74	70.13	69.39	N/A
EE %	5.60	5.75	5.80	N/A
CF %	4.56	5.14	*5.23*	13.00
Ca %	1.11	1.23	1.23	9.5
Avail P %	0.71	0.60	0.60	N/A
Ca: P ratio	1.6	2.1	2.0	N/A
Lysine %	2.10	2.10	2.10	N/A
Met +cys (%)	1.25	1.13	1.15	N/A

Coppens commercial feed (ingredient composition not available)

**Compositionof catfish premix supplied per kg of preinix Vitamin A 20,000,000.00 iu; VitamirD3 2.000,000.00iu: Vitamin E 200,000.00 mg; Vitamin K38,000.00mg; Vitamin B1 20,000.00 mg; Vitamin B2 30,000.00mg: Niacin 150.000.00 mg;Panothenic Acid 50,000.00 mg; Vitamin B6 12,000.00 mg; Vitamin B12 50.00 mg:Vitamin C 50 mg; 0,000.00 mg; Folic Acid 4,000.00 mg; Biotin H12 800.00 mg; Choline Chloride 600,000.00 mg; Cobalt 2,000.00 mg:Copper 4.000.00mg; Iodine 5,000.00mg; Inositol200,000.06 mg:Iron40,000.00mg; Manganese 30,000.00 mg; Selenium 200.00 mg; Zinc 40.000 00 mg. Lysine 100,000.00mg; Methionine 100,000.00 mg; Antioxidant 100,000.00mg

RESULTS AND DISCUSSION

Growth performance of growing Juvenile fed different sources of fishmeal is presented in Table 3. The result showed that final weights, weight gain, feed conversion ratio and for feed cost (N/kg gain) ($p<0.05$) were significantly influenced by fishmeal source. Final body weight was significantly (543.80g) higher for coppens feed, followed by those fed Maiduguri fishmeal (449.90g) and Imported fishmeal (269.50g) while the least was recorded for fish crumbs (190.60g). Mean weight gain of catfish showed that imported commercial feed (coppens) gained the highest weight of 377.13g, followed with a value of 283.23g recorded for Maiduguri fishmeal while the least (23.93g) was recorded for crumbs. This is in line with the findings of Mustapha et al. (2014) in comparative effect of local and foreign commercial feeds on the growth and survival of *Clarias gariepinus* juveniles. The higher weight recorded by catfish on foreign feed (coppens) compared to the Maiduguri fish-based pellets and the other compounded diets could also be due to the higher protein content of the coppens feed (i.e. 42% CP versus 37%CP for the Maiduguri fish, local fish crumbs and the 72% CP imported fish diets). Optimum dietary protein level for juvenile catfish should be 40% CP or higher for optimum growth

performance (Micah, 2012). Feed intake in (gram per fish) did not differ significantly across diets($p>0.05$). The obvious reason for this was because the amount of feed fed to each replicate group of fishes was controlled to avoid feed wastage. There was a significant difference ($p<0.05$) between treatment means for feed conversion ratio although feed conversion ratios were similar ($p>0.05$) between Maiduguri fish pellet, 72% CP imported fish pellet and the coppens feed. It was the fish crumb pellet that gave significantly poorest feed conversion ratio of all the diets fed. Maiduguri fish diet gave the lowest feed cost per kg gain. The cost per kg gain was higher for local fish crumbs feed (₦ 3272/kg gain) compared to the Maiduguri fish feed which gave a very low feed cost per kg gain of only ₦1173.6. Imported 72% CP fish feed and foreign feed (coppens) cost ₦ 1781.7 and ₦ 1258.9respectively. The availability of local ingredient is a major factor in determining how much of an ingredient to use in a commercial diet.

Table 2: Proximate Analysis of Fishmeal

Fish meal sources	% D.M	% C.P	% C.F.	% OIL	% ASH	% NFE
Fish crumbs	91.15	52.50	1.16	6.97	16.28	22.63
Maiduguri Fish	90.68	54.06	0.97	7.66	15.72	21.59
72% CP Import	92.60	23.06	10.01	5.2	10.01	27.05

Table 3: Growth Performance of Catfish fed Three Sources of Protein

Parameter	Maiduguri Fish	Imported fish	Fish crumb	Coppens	SEM
Initial weight (cm/fish)	166.67	166.67	166.67	166.67	0.00
Final weight (gm/fish)	449.90^{b}	269.50^{c}	190.60^{d}	543.80^{a}	20.00
Weight gain (gm/fish)	283.23^{b}	102.83^{c}	23.93^{d}	377.13^{a}	20.72
Feed intake (gm/fish)	406.03	404.25	402.45	414.33	3.72
Feed conversion ratio	1.43^{b}	3.93^{b}	16.82^{a}	1.10^{b}	2.94
Feed cost (₦/kg gain)	1173.60^{d}	1781.70^{b}	3272.00^{a}	1258.90^{c}	347.63

^{a,b,c,d} = Means within on the same row with different superscript are significantly different ($p< 0.05$)
SEM: standard error of mean

CONCLUSION

From the results of this study, it can be concluded that, despite the higher growth rate and better feed conversion ratio obtained with the imported feed (coppens) was found to be more beneficial compared to locally produced feeds as this could result in higher profit for the farmer, It was also observed that Maiduguri fishmeal can easily substitute for the expensive 72% CP imported fishmeal in the local production of fish feed. It is recommended that Maiduguri fish meal can be used to replace 72 % CP imported fish meal in the manufacturing of feed for catfish. This will result in about 49% savings and consequently, higher returns for the farmer.

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