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Effects of Dietary Levels of Jackbean (*Canavalia ensiformis*) Meal on Body Composition of *Clarias gariepinus* Fingerling

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Abstract: *Clarias gariepinus* of average weight 2.80 g were sourced from ARAC, Port Harcourt and used to evaluate the effect of feeding varied levels of Jackbean meal on carcass composition of the fish. 35% isonitrogenous diets of 0%, 5%, 10%, 15% and 20% dietary levels of JBM were formulated. These were fed to the fingerlings randomly assigned to 5 treatments-DT_1 (Control), DT_2, DT_3, DT_4 and DT_5 respectively in 3 replicates of 13 fingerlings, each using 15 plastic aquaria of 250 x 150 cm dimension. The fish were fed at 5% body weight twice daily within the experimental period of 8 weeks. The carcass crude protein content of the treatments (47.65-48.54%) were significantly ($p>0.05$) different, treatments DT_4 and DT_5 higher than the rest. The lipid content of DT_1 (control) was significantly ($p<0.05$) higher than the rest of the treatments. The ash composition for treatments DT_1 (0%), DT_2 (5%) and DT_3 (10%) were significantly ($p<0.05$) lower than DT_4 (15%) and DT_5 (20%). Crude fibre contents for DT_2 and DT_3 were significantly ($p<0.05$) higher than the rest of the treatments, while DT_1 and DT_2 were higher than the rest for the moisture. Based on the trend of the carcass composition of the fish, there seemed not to be a major nutritional difference in the fish flesh due to varied levels of JBM.

Key words: Jackbean, fish flesh, protein requirement

INTRODUCTION

The widening gap between estimated protein requirement and actual protein consumption in many tropical developing nations including Nigeria (FAO, 2002) may be as a result of lack of basic information on the abundant non-conventional feed resources which has limited their usage in balanced and economic rations for fish. This has endangered scarcity of food protein for the ever increasing livestock industry, more so since the competition between man and livestock for conventional feedstuffs has remained very high. Alternative protein sourcing using high ratio of plant protein in fish and livestock diet rations would seem to provide a productive feeding regime (Anyanwu *et al*., 2005), especially for fingerlings of *Clarias gariepinus*.

Jackbean (*Canavalia ensifomis*) in view of its high yield potentials, despite the antinutritional content as with most unconventional seed protein feedstuffs, serves as energy source, as well as protein of relatively good amino acid profile (Esonu, 2009). The objective of this study therefore was to determine the effect of dietary levels of JBM on the body composition of *Clarias gariepinus* fingerlings.

MATERIALS AND METHODS

The experiment was mounted in the fisheries research apartment of the Agric. Department, Alvan Ikoku Federal College of Education, Owerri, using 15 plastic aquaria (250 x 150 cm), covered with mosquito mesh screen to prevent fish from jumping out and possible predation. Jackbean (*Canavalia ensiformis*) harvested from a pilot farm at Orogwe in Owerri West L.G.A. of Imo State was cracked, soaked in water for 24 hours, boiled for an hour, dried and milled into powdered form using a hammer mill to produce the Jackbean meal. The meal was used to make four 35% crude protein isonitrogenous diets at inclusion levels of 5, 10, 15 and 20% for treatments DT_2, DT_3, DT_4 and DT_5 respectively, DT_1 (0%) being the control treatment. Maize was used as the major source of energy in the diets, while soyabean meal and fish meal were major sources of protein. These and other ingredients (Table 1) in their various proportions were finely ground and mixed in plastic bowl into dough form using hot water, with cassava starch as binding material. The mixture was then pelleted by passing it through a mincer of 2 mm die to produce 2 mm diameter size of pellets. These were then sundried to about 10% moisture content, packed in polythene bags and kept safely dry for use. One hundred and ninety-five fingerlings of *Clarias gariepinus* of average weight 2.8 g, obtained from the African Regional Aquacultural Centre (ARAC), Port Harcourt were used for the study. The fish were acclimatized for 7 days using the 0% (control) Jackbean meal diet of 35% CP fed to them twice daily at 08.30-09.30 hr and 17.30-18.30 hr. Subsequently the fingerlings were completely randomized in 3 replicates of 13 fingerlings per replicate

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Table 1: Gross composition of experimental diets using jackbean meals

	Dietary levels of jackbean				
Ingredients	0%	5%	10%	15%	20%
Jackbean	-	5.00	10.00	15.00	20.00
Maize	33.10	30.10	28.00	25.60	20.10
Fishmeal	18.00	18.00	18.00	18.00	18.00
Soybean	44.00	42.00	39.10	36.50	37.00
Cass. starch	2.00	2.00	2.00	2.00	2.00
Palm oil	1.00	1.00	1.00	1.00	1.00
Lysine	0.20	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20	0.20
Vit premix	0.50	0.50	0.50	0.50	0.50
Common salt	0.50	0.50	0.50	0.50	0.50
Bone meal	0.50	0.50	0.50	0.50	0.50
Total	100.00	100.00	100.00	100.00	100.00

for the 5 treatments-DT_1 (control), DT_2, DT_3, DT_4 and DT_5. The fish were fed at 5% body weight twice daily at 08.30-09.30 hr and 17.30-18.30 hr. The water in the aquaria was regularly monitored for some physico-chemical properties namely temp., pH and dissolved oxygen and renewed every other day within the experimental period that lasted 56 days of culture. The chemical composition of the diets were determined to ascertain their proximate compositions with regard to the moisture content, ash, lipid, crude protein, crude fibre and nitrogen free extract. Proximate analysis of the carcass was also carried out biweekly using the AOAC (1990) methods and the data were subjected to Analysis of Variance (ANOVA) as described by Steel and Torrie (1980). Test of significance was by Duncan Multiple Range Test (DMRT) at 95% confidence level, using Statistical Package for Social Sciences (SPSS) for windows (Version 7.5).

RESULTS AND DISCUSSION

The proximate composition of the experimental diets for crude protein were similar (35% CP) for the 0% (control), 5%, 10%, 15% and 20% dietary inclusion levels of Jackbean meal (Table 2). The 0% JBM inclusion diet had the highest crude fibre and ether extract levels, while the 5% and 10% dietary levels had the lowest crude fibre and ether extract respectively. The ash content of the diets ranged from 8.29% to 9.31%, the 20% JBM inclusion diet being the highest while the 0% (control) diet was the lowest. The energy levels of the diets increased with increase in JBM dietary inclusion levels. The control diet had the lowest while the 20% JBM diet was the highest. These dietary proximate composition levels seemed to be in agreement with the observation of Adegbeleye *et al.* (2001) on Jackbean meal as an ingredient in the diets for *Clarias gariepinus* fingerlings. The increase in energy level of the diets with increase in dietary levels of JBM is an indication of the high energy level of JBM. Udedibie (1990) reported energy level of 4600 kcal for Jackbean meal which is comparatively higher than those of other dietary seed meals. One of the major problems and limitations of non-conventional feedstuffs is their content of toxic substances (Okoli *et al*., 2003; Kekeocha and Anyanwu, 2005). Jackbean meal contains 28-32% crude protein and had been reported to contain toxic substances, particularly the L-canavanine which limits its use as feed ingredient, for livestock, especially monogastric animals, including fish (Udedibie, 1997; Esonu, 2009).

Fish fed varied dietary levels of JBM showed no significant ($p>0.05$) difference in their carcass protein contents (Table 3), treatments DT_4 and DT_5 higher than the rest. The observed range of 47.05-48.54% measured closely with the 35.66-56.85% reported by Adegbeleye *et al.* (2001). This observation was contrast to those of Ali *et al.* (2005) and Ali *et al.* (2006) who reported much higher carcass protein values. Size of fish, feeding regime, culture restriction and specie differences were posited to influence carcass composition of fish.

Table 2: Chemical composition of dietary levels of jackbean meals

Parameters	0%	5%	10%	15%	20%
Crude protein (%)	35.00	35.01	35.02	34.98	35.00
Crude fibre (%)	3.81	2.93	3.57	3.70	3.66
Ether extract (%)	7.54	7.27	7.05	7.20	7.22
Moisture (%)	12.16	12.22	12.18	12.20	12.21
Ash (%)	8.29	8.88	9.18	9.29	9.31
NFE (%)	33.20	33.69	33.00	32.63	32.60
ME (kcal/g)	2710.00	2800.00	2870.00	2940.00	3010.00

Table 3: Carcass composition of *Clarias gariepinus* fingerlings fed varied levels of jackbean meals

Parameters	Initials	DT_1 (0% control)	DT_2 (5%)	DT_3 (10%)	DT_4 (15%)	DT_5 (20%)	SEM*
Crud protein (%)	47.02	47.65^b	47.70^b	47.80^b	48.41^a	48.54^a	0.17
Lipids (%)	11.82	13.77^a	12.75^b	12.64^b	12.52^b	12.40^b	0.21
Ash (%)	12.00	12.64^b	12.78^b	12.86^b	13.14^a	13.53^a	0.14
Crude fibre (%)	1.66	1.65^b	2.03^a	2.07^a	1.55^b	1.53^b	0.11
Moisture (%)	22.37	24.40^a	24.23^a	22.98^b	22.89^b	22.37^b	0.35

Means of triplicate data in each row with similar superscript are not significantly different ($p>0.05$). *Standard error of pooled means

The observations of this study upto 20% JBM inclusion level indicates that JBM has the potential for use as a primary source of protein in animal feeds as earlier observed by Udedibie (1990). The importance of energy in fish nutrition as discussed by Lovell (1976), NRC (1993) and Bakke-MaKellep *et al.* (2007), is that low energy in the ration means that protein may not be fully utilized to the fullest potentials. As the JBM dietary level increased, there was a corresponding increase in energy level of the diet and also increase in carcass protein, while lipids decreased. Carcass lipid for the control was significantly ($p<0.05$) higher than those of JBM inclusion levels, with a range of 12.40-13.77%. Lower values were reported (Ochang *et al.*, 2007; Mazumder *et al.*, 2008) for small indigenous fish species like Clarias and Carp, while upwards of 16% had been observed (Ali *et al.*, 2005). Lipid composition of fish was reported to vary with feed intake and season, within and between species.

The carcass moisture content of the treatment decreased with increase in the dietary inclusion levels of JBM and maintained about similar trend with the lipid contents. The ash composition of the fish ranged between 12.64-13.53% and increased with increasing levels of JBM. As dietary ash increased, there was a corresponding increase in the ash content of the carcass. Similar levels were reported by Ali *et al.* (2005) and Ali *et al.* (2006) in their studies on some indigenous fish species in Bangladesh. The crude fibre level of the carcass (1.53-2.07%) for the control (0%), 15% and 20% JBM dietary treatments were significantly ($p<0.05$) lower than those of 5% and 10% JBM dietary treatments. The crude fibre increased with increase in JBM inclusion until 10% inclusion level and dropped at 15% and 20%. The trend may likely be associated with dietary crude fibre levels of the treatments. The result of the study therefore showed that JBM could be used in the diet for *Clarias gariepinus* upto 20% inclusion level without deleterious effect on the carcass content and composition.

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