Nutrient Utilization And Growth Responses Of *Clarias Gariepienus* Fingerlings Fed Dietary Levels Of Jackbean (*Canavalia Ensiformis*) Meal.

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ABSTRACT: 35% isonitrogenous diets of 0%, 5%, 10%, 15% and 20% dietary levels of JBM were formulated and used to evaluate its effect on growth and nutrient utilization of fingerlings of *Clarias gariepinus*. The diets were fed to the fingerlings randomly assigned to 5 treatments – Trt.I (control), Trt.II, Trt.II, Trt.IV and Trt. V respectively in 3 replicates of 13 fingerlings each, using 15 plastic aquaria of 250 x 150cm dimension. The fish were fed at 5% body weight twice daily within the 56days experimental period. Mortality was highest in Trt.II and least in the control (Trt.I). Daily feed intake and protein intake were not significantly (P>0.05) different. Trt.IV had the highest body weight gain, followed by Trt.III, Trt.V, Trt.II and Trt.I. The specific growth rate, protein efficiency ratio and feed conversion ratio of the treatments were significantly (P<0.05) different, treatments iii, iv and v better than treatments I and ii. Dietary levels of JBM up to 20% inclusion therefore showed a significant contribution as feedstuff in the diets of *Clarias gariepienus* fingerlings.

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Introduction

Clarias gariepinus is a fresh water fish, but can thrive in brackish water. It is suited in low technology farming system mainly because of its growth rate, efficient use of aquatic foods, propensity to consume a variety of supplementary feeds, omnivorous food habits and tolerance to a wide range of environmental conditions (Anyanwu, 2005).

Feed however is responsible for 60 – 80% of the total cost of production in aquaculture (Eyo, 2001), and this has necessitated the growing interest in the use of cheap non conventional feedstuff in fish nutrition in Nigeria. The need to formulate fish feeds with cheap and locally available feed resources that are not in direct competition with human foods has been widely accepted (Kekeocha and Anyanwu, 2005). The formulation of fish feed in a country deficient of food grains adds greater challenge to nutritionists who must find cheap unconventional feedstuff for fish. Jackbean (*Canavalia ensiformis*) has been identified as a grain legume that offers good possibilities for its use, and also an indigenous legume that serves as energy and protein source for livestock production in view of its high yield and protein content of relatively good amino acid profile (Udedibie and Carlini, 1998). Besides, there is no competition existing between man and livestock for it as feed, though the young green pods are eaten as vegetable in the far East tropical Asia and Japan. The objective of this study therefore was to determine the effect of dietary levels of JBM on nutrient utilization and growth of fingerlings of *Clarias gariepinus*.

Materials and Methods

The experiment was mounted in the Dept of Agric Science, Alvan Ikoku Federal College of Education Owerri farm house. 15 plastic aquaria (250 x 150cm), covered with mosquito mesh screen to prevent fish from jumping out and possible predation were used.

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 under the sun and milled into powered form using a hammer mill to produce the Jackbean meal.

The meal was used to make 35% isonitrogenous dietary levels of JBM – 0%, 5%, 10%, 15% and 20% for treatments Ti (control), Tii, Tiii, Tiv and Tv respectively. Maize was used as the major source of energy in the diets, while Soyabean mean 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 mixer of 2mm die to produce 2mm 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 2.80g, 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) JBM diet of 35% CP and fed twice daily at 08.30 – 09.30 hr and 17.30 – 18.30hr. The fingerlings were completely randomized in 3 replicates of 13 fingerlings per replicate for the 5 treatments – Ti (control), Tii, Tiii, Tiv and Tv. The initial weight of fish in the aquarium was taken and recorded. Feeding commenced an hour after weighing exercise and the fish fed at 5% of their body weight twice daily, morning (08.30 – 09.30hr) and evening (17.30 – 18.30hr). Body weight measurements were taken biweekly, and rations adjusted according to fish weight gain. The water in the aquaria was regularly monitored for the physico-chemical properties and renewed completely every other day within the experimental period that lasted 56 days of culture. Temperature was determined using mercury in glass thermometer calibrated from 0 – 100^{o}c; immersed 5cm deep on the water surface. The pH and dissolved oxygen readings were taken using pH and oxygen meters respectively.

The proximate analysis of the test feedstuff and diets were carried out to determine the moisture content, ash, lipid, crude protein, crude fibre and nitrogen free extract, using the A.O.A.C. (1990) and Kekeocha (2001) methods. Growth and nutrient utilization index were calculated according to Brown (1957) and A.O.A.C (1990). 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).

Result and Discussion

The mean values for the water condition of the experimental aquaria (26.02 ± 0.01^{o}C, 6.50 ± 0.03 and 4.90 ± 0.06 mg/l for temperature, pH and dissolved oxygen respectively) fall within the optimal requirements for fish production (Jhingram and Pullin, 1985; Ochang et al, 2007). The chemical 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 (Tables 1 and 2). The 0% JBM diet had the highest crude fibre and either extract levels, while the 5% and 10% dietary levels had the lowest crude fibre and ether extract respectively. The 20% JBM diet was highest in ash content while the 0% (control) diet was the least.

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 observations were seemingly in consonance with the report of Alegbeleye *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 proximate values of 28.50%, 3.74%, 3.1%, 7.8% for crude protein, ash, ether extract, crude fibre respectively and also energy level of 4600kcal for JBM which is comparatively higher than those of other dietary seed meals. JBM 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). The result of the experiment revealed increase in body weight of the experimental fish (Table 3) – 2.21g, 2.33g, 2.92g, 3.37g and 2.59g for treatments Ti, Tii, Tiii, Tiv and Tv respectively for 0% 5%, 10%, 15% and 20% JBM dietary inclusions respectively. The daily feed intake and protein intake for the treatments were not significantly ($P>0.05$) different. The intake of the fish in control diet without a corresponding increase in weight is most likely to be as a result of the lower energy level of the diet as compared with other treatments. The importance of energy in fish nutrition as discussed by Lovell (1976), NRC (1993) and Bakke – Mckellep et al (2007), is that low energy in the ration means that protein may not be fully utilized to the fullest potentials. The specific growth rate, protein efficiency ratio and feed conversion ratio of the dietary treatments were significantly ($P<0.05$) different, treatments iii, iv and v better than treatments i and ii. Range values of 1.03 – 1.43%/day, 1.40 – 1.76 and 2.36 – 3.48 were observed for SGR, PER and FCR respectively. These values are in line with some feeding trail reports on indigenous and freshwater species of fish (Alegbeleye et al, 2001; Babalola and Apata, 2006; Oyelese, 2006). The trend of the observation on this study shows that despite the limitation of JBM as with most other seed meals and non conventional feedstuffs, for their content of toxic substances, its dietary levels upto 20% measured up nutritionally well in improving the performance of the fish. There were also no observed deleterious effects of the dietary levels of JBM on *Clarias gariepinus* fingerlings.

Table 1: Gross Composition of Experimental Diets using Jackbean meals. Dietary Levels of Jackbean

Ingredients	**0%**	**5%**	**10%**	**15%**	**20%**
Jackbean	-	5	10	15	20
Maize	33.1	30.1	28.00	25.6	20.1
Fish meal	18	18	18	18	18
Soybean	44	42	39.1	36.50	37
Cassava starch	2	2	2	2	2
Palm oil	1.0	1.0	1.0	1.0	1.0
Lysine	0.2	0.2	0.2	0.2	0.2
Methionine	0.2	0.2	0.2	0.2	0.2
Vit. Premix	0.5	0.5	0.5	0.5	0.5
Common Salt	0.5	0.5	0.5	0.5	0.5
Bone meal	0.5	0.5	0.5	0.5	0.5
Total	**100**	**100**	**100**	**100**	**100**

Table 2: Chemical Composition of dietary levels of Jackbean meal.

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
Ash (%)	8.29	8.58	9.18	9.29	9.31
NFE (%)	33.20	33.69	33.00	32.63	32.60
Moisture (%)	12.16	12.22	12.18	12.20	12.21
ME (kcal/kg)	2,710	2,800	2,870	2,940	3,010

Table 3: Growth and Nutrient Utilization of *Clarias gariepinus* fingerlings fed varied levels of Jackbean meal.

Parameters	**Trt.i (0% JB) Control**	**Trt.ii (5% JB)**	**Trt.iii (10% JB)**	**Trt.iv (15% JB)**	**Trt.v (20% JB)**	***SEM**
Initial weight (g)	2.79	2.79	3.09	2.64	2.51	0.09
Final weight (g)	5.00	5.12	6.01	6.01	5.10	0.21
Increase in Body weight (g)	2.21	2.33	2.92	3.37	2.59	0.19
Mortality (%)	18	20	24	22	22	0.91
Daily feed intake/fish (g)	0.14^{a}	0.14^{a}	0.14^{a}	0.14^{a}	0.13^{a}	0.001
S.G.R. (%/day)	1.03^{b}	1.17^{b}	1.32^{a}	1.45^{a}	1.32^{a}	0.06
Daily Protein intake (g)	0.03^{a}	0.03^{a}	0.03^{a}	0.03^{a}	0.03^{a}	0.00
PER	1.40^{b}	1.45^{b}	1.61^{a}	1.76^{a}	1.54^{a}	0.05
FCR	3.48^{b}	3.35^{b}	2.72^{a}	2.36^{a}	2.85^{a}	0.18

Means of triplicate data in each row with similar superscript are not significantly different (P>0.05).

** Standard error of pooled means.*

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