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30TH ANNUAL CONFERENCE, FISON DELTA, 2015

Dear Olukunle. O.A., Oshoke O.J. and Idowo O.G. ,

Letter of Acceptance of Manuscript(s) for presentation

We are pleased to inform you that your manuscript(s) titled "**EFFECT OF PARTIAL REPLACEMENT OF SOYBEAN MEAL WITH OF JACKBEAN (*Canavalia ensiformis*) AS AN ALTERNATIVE PLANT PROTEIN IN THE PRACTICAL DIETS OF CAT FISH (*Clarias gariepinus*)."** has been accepted for presentation at 30th Annual Conference of Fisheries Society of Nigeria holding at Asaba from 23rd – 27th November, 2015. The manuscript is registered in our database as FISOND2015/AQ/047. Please refer to this number in your subsequent communications with us.

Authors are to come to the conference with evidence of payment and CD-ROM containing the manuscript prepared as power point **only**.

You are welcome to Asaba at FISON, 2015.

Yours sincerely,

Dr. J. A. Meye
Conference Editor

EFFECT OF PARTIAL REPLACEMENT OF SOYBEAN MEAL WITH JACKBEAN (*CANAVALIA ENSIFORMIS*) AS AN ALTERNATIVE PLANT PROTEIN IN THE PRACTICAL DIETS OF CAT FISH (*CLARIAS GARIEPINUS*)

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ABSTRACT

This study assessed the potentials of Jackbean seed meal (JBSM) for partial replacement of soybean in diets of *Clarias gariepinus*. Hence, five diets were formulated at 40% crude protein level as Soybean in control diet (CD) was replaced progressively at (5%, 10%, 15% and 20%) by JBSM in test diets TD1, TD2, TD3, TD 4 respectively. The Jackbean seeds were treated by dehulling, soaking in ash and followed by boiling to reduce the anti nutritional content (canavanine) present in the seeds. Fifteen plastic tanks of (37 liters) containing 25 liters of water was used for growth trial. Each treatment contained 15 fingerlings with an average weight of 6.44 ± 0.1g in three replicates per treatment. Test fish in each tank were fed 5% of their biomass twice daily for 84days. At the end of the experiment proximate composition and growth parameters were analyzed. Result showed that fish fed TD 1 (5% inclusion level) and TD2 (10% inclusion level) compared favourably with the control diet ($P < 0.05$). Fish fed control diet had the best specific growth rate (0.54) and feed efficiencies (Protein Efficiency Ratio (PER)= 0.41 and (Food Conversion Ratio, FCR= 6.57). However, considering the results of the statistical analysis used to compare the difference between the means of the different treatment, TD1 (5% inclusion level) compared most favourable with the control in terms of mean weight gain (8.87), specific growth rate (0.39) which was significantly different ($P < 0.05$) from other treatments, PER from CD, TD3 and TD4 which are not significantly different ($P > 0.05$) from TD2 and FCR (9.41) which was not significantly different ($P > 0.05$) from CD but significantly different ($P > 0.05$) from TD2, TD3 and TD4. From the results of this study, it shows that 5% of soybean in the diet can be replaced with JBMS without any adverse effect on the growth performance.

INTRODUCTION

Fish is an important source of both food and income to many people in developing countries. In Africa, as much as 5% of the population depend wholly or partly on the fisheries sector for their livelihood (Mustapha 2013). The majority of the fish supply comes from the rivers in the continent. While capture fisheries based on species that are presently exploited seem to have reached their natural limits (FAO, 1996), there is considerable potential to expand aquaculture in Africa in order to improve food security (Jamu and Ayinla, 2003). Nutrition plays a critical role in intensive aquaculture as it influences not only the production cost but also fish growth, health and waste production (Gatlin, 2002). Cost effective diets are essential for successful fish farming. The profitability and success of compound feed production depends on the cost, availability and digestibility of the feed ingredients to be used. Therefore, there is a need to search for lesser known materials suitable for fish feed. Legumes are less expensive sources of protein that have been identified to be capable of reducing the cost of fish feed when combined as complementary ingredients to meet the nutritional requirement of fish. Soybean meal has high protein content and the best protein quality among plant protein feedstuffs used in fish feeds (Davies et al, 1999). However, wider utilization and availability of this conventional source for fish feed is limited by increasing demand for human consumption and by other animal feed industries (Siddhuraju and Becker, 2001). According to Balogun (1988) this has hindered the expansion and profitability of aquaculture enterprise in many developing countries and has encouraged the need to look for cheaper alternative protein source for the development of low-cost feed that can replace this conventional feedstuff without reducing the nutritional quality of the diets. This study,

therefore was designed to evaluate the effect of partial replacement of soybean meal with JBMS flour as an alternative plant protein source in the diet of *Clarias gariepinus* fingerlings**.**

MATERIALS AND METHODS

The experimental work was carried out in the research laboratory of the Department of Wildlife and Fisheries Management teaching laboratory, University of Ibadan, Nigeria. A total of fifteen plastic circular experimental tanks of 37 liters covered with mosquito mesh nylon screen to prevent fish from jumping out and possible predation were used. Each of the six treatments was replicated in triplicates. Fingerlings of the African catfish, *C gariepinus* were obtained from OGADEP, Ikenne zone in Ogun State, Nigeria and transported in oxygen bags to the laboratory. The fish were then acclimatized to laboratory conditions and fed with a commercial fish feed (35% CP) for 14 day. After acclimation, groups of fifteen *C.gariepinus* juveniles with average weight of 6.5g were randomly stocked into the fifteen circular plastic tanks containing 25litres of water each for the growth trials. Experimental tanks were well aerated using air stones and aerator pump (Lawson, 1995) throughout the period of the experiment to maintain relatively uniform physiochemical parameters.

The Jackbean seeds were obtained from the Department of Agronomy, University of Ibadan. The seeds were soaked in warm water (60^oC) for 90 minutes and then dehulled. This treatment was followed by soaking in ash (50g ash per 25litre of water) for 72 hours with changing of water every 12 hours. Finally, the Jackbean seeds were boiled for 2 hours while water was changed every 30 minutes during the period. After which the seeds were oven dried and ground into flour. The experimental feed were prepared using the following ingredients, soybean flour, JBSM , fishmeal, cornmeal, palm oil, wheat offal, vitamin premixes and mineral premixes, all the ingredients were obtained from a commercial feed mill (Ogo-Oluwa Interbiz), opposite U.I 2^{nd} gate-Ibadan.

All dry ingredients were milled together with the hammer milling machine to obtain fine particulates, The crude protein content of the diets were kept essentially at the 40%CP level since this was determined as the protein requirement of fingerling catfish hybrid in (Eyo and Falayi, 1999). Each diet was first mixed dry and later with just enough warm water to obtain homogenous hard-paste(dough) and pelletized out into flat tray through 2mm die disc holes in different lengths. The pellets were sun dried at ambient temperature of 30^oC for three days and stored in air tight plastic at 26^oC. (Table 1) shows the dietary composition..

Each of the diets was fed to the fish in triplicate at 5% body weight twice daily (between 7.00am and 7.30am, and 4.00pm and 4.30pm) for 12 weeks. The weight of each group of fish was taken fortnightly using electronic top loading balance and the feed adjusted accordingly.

The water quality parameters of dissolved oxygen, temperature and pH were monitored on alternate days. Early in the morning (7.00 – 8.00 am) on the days when the water quality parameters were taken, Digital dissolved metre (manufactured by American Marine Inc.) was used to take the Dissolved oxygen, while the water temperature and pH values of the experimental tanks were measured using Digital/electronic temperature probe and a pH meter respectively.

Using the ingredients, five practical diets containing 40% CP were formulated, a control and four test diets. Jackbean flour was incorporated at four inclusion levels 5%, 10%, 15% and 20% (Table 1).

Table 1: Diet composition of formulated feed at 40% Crude Protein (g/100g)

Ingredients	Control	5%	10%	15%	20%
Soybean (42%)	47.20	44.84	42.48	40.12	37.76
Jackbean flour	-	2.36	4.72	7.02	9.44
Fishmeal	23.60	23.60	23.60	23.60	23.60
Cornmeal	10.62	10.62	10.62	10.62	10.62
Palm oil	5.0	5.0	5.0	5.0	5.0
Wheat offal	10.62	10.62	10.62	10.62	10.62
Vitamin premix	2.0	2.0	2.0	2.0	2.0
Mineral premix	1.0	1.0	1.0	1.0	1.0
Total	100.04	100.04	100.04	100.04	100.04

RESULTS

PROXIMATE COMPOSITION OF EXPERIMENTAL DIETS

Table 2: Proximate Composition of experimental fish before and after feeding trials.

Parameters		CD	TD1	TD2	TD3	TD4	MEAN	STDDEVs
Crude Protein (%)	13.30	16.45	15.86	15.85	14.91	13.4	15.29	± 1.07
Crude Fibre (%)	0.51	0.21	0.26	0.34	0.32	0.10	0.25	± 0.09
Crude Fat (%)	5.23	5.10	4.70	4.18	5.80	5.20	4.99	±4.99
Ash (%)	1.22	2.20	2.70	2.01	1.78	1.53	2.04	±0.40
Moisture (%)	77.61	75.80	76.43	77.32	76.90	78.4	76.97	±1.09

Table 3: Performance of *Clarias gariepinus* fingerlings fed diets with different inclusion levels of Jackbean (*Canavalia ensiformis*) over an 84 days test period

Parameters	CD	TD1	TD2	TD3	TD4	MEAN	S.E.M
Mean initial weight (g)	6.36	6.37	6.55	6.40	6.48	6.44	±0.10
Mean Final weight (g)	9.98	8.87	8.69	8.25	7.97		
Mean weight gain (g)	3.62	2.50	2.14	1.85	1.49	2.32	±0.73
Mean feed intake/fish (g)	23.8	23.52	23.07	22.04	21.65	22.82	±0.84
Specific growth rate	0.54^{a}	0.39^{b}	0.33^{c}	0.30^{c}	0.25^{d}	0.36	±0.10
Protein consumed (g)	8.91	8.93	8.90	8.76	9.10	8.92	±0.11
Protein Efficiency Ratio	0.41^{a}	0.28^{b}	$0.24b^{c}$	0.21^{cd}	0.16^{d}	0.26	±0.09
Food Conversion Ratio	6.57^{cd}	9.41^{bed}	10.78^{abc}	11.91^{ab}	14.50^{a}	10.63	±2.63
Gross efficiency of food conversion	15.22	10.62	9.26	8.40	6.90		
Survival (%)	64.4	60.0	62.2	35.6	20.0		

A,b,c…. Means in the same row having different superscripts are significantly different (P < 0.05), while means in the same row having same supersc,ript are not significantly different (P>0.05).

DISCUSSION

The diets containing higher levels of JBSM produced significantly lower levels of protein and fat in the fish. This agrees with the findings of Dabrowski *et al*., (1981) for carp with rapeseed meal. Hossain and Jauncey (1981);and Olukunle(1996) noted same pattern for common carp fed diets containing mustard oil cake, linseed and sesame meal s and cake *for C.gariepinus* respectively.

The Mean final weight gain generally decreased with increasing levels of JBMS in diets. The control diet recorded the best weight gain (3.62g) which was significantly different (p>0.05) from the weight gain (1.49g) of fish fed diet containing 20% JBMS. Similarly, the specific growth rate (SGR) also displayed a decreasing trend with increasing levels of JBMS flour in the diets; This indicates that increasing dietary level of JBSM markedly reduced the growth performance of *C. gariaepinus*. Olvera et al., (1988) observed the same trend for tilapia fed sabania seed meal. The best performance (0.54g) was obtained in fish fed the control diet CD (0% JBSM) followed by fish fed 0.39%nsc diet TD1 (5% jackbean seed flour) while the lowest value (0.25g) was recorded in fish fed on diet TD4 specific growth rate. The better growth performances recorded in dietary treatment TD1 may be due to lower level of inclusion which enhanced its nutritional composition, palatability and bioavailability. The decrease in growth performance experienced by the fish fed diets containing increased inclusion levels may be attributed to the presence of anti-nutritional factors (ANF) in JBSM. Substantial quantities of ANF have been reported in Jack bean seed (Belmaar and Morris 1994, Gomes-Sotillo et al., 1993). Protease inhibitors (trypsin and chymotrypsin inhibitors) are known to decrease the growth performance of animals (Liener 1994) and many fish are known to be sensitive to trypsin inhibitors (Shu, 1992). Significant growth reduction have been observed when fish were fed diets with low levels of tannic acid (Becker and Makkar 1999). Similarly, Muckhopadhyay and Roy (1996) reported that incorporating Sal (Shorea robusta) seed meal containing high amounts of phenolics into the diets of Indian major carp fingerlings reduced growth. Siddhuraju and Becker (2001) also reported that saponins in legumes are considered toxic or growth retardants to fish. There exists a significant difference (P>0.05) between the weight gain in treatments CD to TD4, but the least significant difference comparison of the various treatments showed that treatment TD1 can be preferred to treatment TD2, TD3 and TD 4. At 5% inclusion level, TD1 showed no significant difference (P >0.05) in growth performance of fish when compared with the control diet. It has been reported that

Canavalia ensiformis is deficient in sulphur-containing amino acids (Bressani *et al*., 1987). This may also have contributed to the relatively poor performance by the test fish.

CONCLUSION AND RECORMENDATION: In conclusion, the present study revealed that 5% of soybean in the diet can be replaced with Jackbean meal without any adverse effect on the growth performance. It is therefore recommended that further long-term toxicological studies should be carried out to assess the effect of processing methods on Canavalia meal as a partial replacement for fish diets. Such studies will be necessary so that higher levels of inclusion can be possible.

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