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PRODUCT QUALITY ASSESSMENT OF CLARIAS GARIEPINUS FED DIETARY LEVELS OF AZADIRACHTA INDICA LEAF MEAL.

ABSTRACT

This feeding trial was conducted to assess the body composition and product quality of *Clarias gariepinus* fed dietary levels of *Azadirachta Indica* leaf meal (AILM). Four isonitrogenous diets of 36% crude protein were formulated containing 0, 5, 10 and 15% AILM (Diets 1-4) to partially replace other protein ingredients in their diets. The diet containing 0% leaf meal (Diet 1) served as the control. Each dietary treatment was tested in triplicate group of 15 fingerlings per aquarium. Samples from each treatment were analyzed bi-weekly to evaluate their carcass composition, while organoleptic assessment was carried out at the end of the experiment to determine the end product quality. The results for carcass composition show that fish fed on diets 3 and 4 (10% and 15% AILM respectively) were significantly ($P<0.05$) higher in crude protein but were significantly ($P<0.05$) poorer in moisture content. Crude fibre was significantly ($P<0.05$) highest for fish fed on diet 4. Quality of all the fish were very high, with those fed on diet I (control) significantly ($P<0.05$) superior. The present study shows that AILM has good potentials for use as a protein source in *Clarias gariepinus diet,* without grossly affecting the product quality.

Key words: *Product quality assessment, Clarias gariepinus*, *Azadirachta indica leaf meal,*

Introduction

Feeds and feeding are among the most important factors influencing growth, feed utilization and tissue composition of fish in intensive culture (Okumus and Mazleum, 2002). The live weight of majority of fish usually consists of about 70-80% of water, 20-30% of protein and 2-12% of lipids. However, these values may vary considerably within and between species, and also with size, sexual condition, feeding, time of the year and physical activity (Lovell, 1980; Ali *et al* 2006). The distribution of substances among the various organs and tissues of the body may also show considerable differences. Several systematic studies have related diet compositions to the

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organoleptic quality of fishes. Observations have shown that fish can quickly concentrate organoleptically active compounds in their tissues, producing flavours that can later pose serious marketing and nutritional problems (Yamada, 1983; Ochang *et a,l* 2007; Anyanwu *et al*, 2005; Anyanwu *et al*, 2012). *Clarias gariepinus* however are economically important food fish, cultured primarily in fresh water ponds in tropical countries and these exhibit qualities that endear them of much commercial importance in Nigeria (Fish Base 1991; Babalola and Apata 2006; Anyanwu 2005). The purpose of this study was to evaluate the product quality of *Clarias gariepinus* fed dietary levels of *Azadirachta indica* leaf mean (AILM).

Materials and methods

The leaves of *Azadirachta Indica* used for this study were harvested from farms around Owerri, Imo State of Nigeria. The leaves were sundried and milled using hammer mill to produce the leaf meal. Samples of the leaf meal were subjected to proximate analysis according to AOAC (1995) methods. Other ingredients used for the feed were bought at fidelity feed mill in Owerri Imo State. Four isonitrogenous (36% CP) diets were formulated as shown in table 1. The diets had 0%, 5%, 10% and 15% inclusion levels of the leaf meal respectively. The feed stuffs were finely ground and thoroughly mixed in a plastic bowl using hot water. The mixture was then pelleted by passing it through a mincer of 2mm diameter to produce 2mm diameter size of the pellets. The pellets were sundried for three days and stored in air tight nylon bags. Proximate compositions of the diets were also determined.

Table 1: Gross composition of experimental diets using *Azadirachta Indica* leaf meal.

	Treatments			
Ingredients	**Diet 1**	**Diet 2**	**Diet 3**	**Diet 4**

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	(0%)	(5%)	(10%)	(15%)
Maize	34.5	30.8	27.1	23.5
Fish meal	20.0	20.0	20.0	20.0
Soya bean meal	35.1	33.8	32.5	31.1
AILM	0.0	5.0	10.0	15.0
Cassava starch	2.0	2.0	2.0	2.0
Palm oil	1.0	1.0	1.0	1.0
Bone meal	1.0	1.0	1.0	1.0
Lysine	2.0	2.0	2.0	2.0
Methioine	2.0	2.0	2.0	2.0
Vitamin premise	0.5	0.5	0.5	0.5
Common slat	0.5	0.5	0.5	0.5
Blood meal	5.0	5.0	5.0	5.0
Total (%)	**100.0**	**100.0**	**100.0**	**100.0**
Proximate composition				
Crude protein (%)	36.00	36.00	36.00	36.00
Crude fibre (%)	13.00	13.60	14.20	14.72
Ether extract (%)	2.59	3.24	3.89	4.53
Ash (%)	6.98	7.29	7.60	7.90
ME (Kcal/kg)	3220.73	3043.80	2860.65	2660.09

The experimental fish post fingerlings, 180 in number were acclamatized for 7 days. Thereafter were completely randomized in 3 replicates of 15 each, and assigned to the 4 treatments – Diet1, Diet2, Diet3 and Diet4 at recorded initial weights. The fish were fed at 5% of their body weight twice daily, morning (08.00-09.00) and evening (17.00-18.00).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 for 56 days of culture. Proximate analysis of the test feedstuff, diets and biweekly fish samples were carried out to determine the moisture content,

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ash, lipid, crude protein, crude fibre and nitrogen free extract using the AOAC (1995) and kekeocha (2001) method. The organoleptic assessments of both fresh raw and cooked samples of fish were also carried out. Five well trained literate adults selected for their interest and sensorial capabilities of memorizing stimuli or discriminating intensities were used (Ochang *et al*, 2007). Thirteen (13) characteristics were assessed using a 6 point assessment score chart (Anyanwu, 2005). Average score of less than or equal to 3.5 indicated freshness (of good quality), while mean scores above 3.5 indicated poor quality. Data collected were subjected to analysis of variance (ANOVA) as described by Steel and Torrie (1980). Test of significance was by Duncan Multiple Range Test at 95 confidence level using Statistical Package for Social Sciences (SPSS) for windows (version 7.5)

Results

The diets used for the feeding trial, the ingredients composition as well as the proximate composition are presented in table. The diets were isonitrogenous (36%CP) The crude fiber, ether extract and ash content of the diets increasd with increasing levels of AILM while energy content of the diets decreased with increasing levels of AILM. The proximate composition of the experimental leaf meal (AILM) is presented in table 2.

Table 2: Chemical composition of *Azadirachta Indica* leaf meal.

Moisture content (%)	21.50
Crude protein (%)	20.37
Ash (%)	9.52
Crude fiber (%)	16.00
Ether extract (%)	2.48
Nitrogen free extract (%)	21.95

Crude protein content was found to be 20.37%. Ash, crude fibre, lipids and moisture contents were 9.52%, 16.00%, 2.48% and 21.95% respectively. Water quality condition in the experimental aquaria showed very little variation throughout the feeding trial (table 3).

Table 3: Limnological parameters

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Treatments	Temp. Range (^{o}C)	Mean Temp. (^{o}C)	pH Range	Mean pH	Dissolved Oxygen (DO) Range (mg/L)	Mean DO (mg/L)
Diet 1 (0%)	24-28	26.0	6.0-6.9	6.3	3.5-6.0	4.5
Diet 2 (5%)	24-28	25.0	6.2-6.9	6.4	3.0-55	4.6
Diet3 (10%)	24-28	26.2	61-6.7	6.5	2.4-5.7	4.2
Diet4 (15%)	24-28	26.0	5.9-6.7	6.4	3.1-5.6	4.4

The mortality rate of fish on the different dietary treatments is shown in table 4. Mortality was a high as 52% in fish fed diets 2 and 3 containing 5% and 10% AILM respectively. Carcass compositions of the dietary treatments are also presented in table 4

Table 4: Carcass composition of *C. gariepinus* fed dietary levels of *Azadirachta Indica* leaf meal.

	Treatments				
Parameters	**Initial**	**Diet 1 (0%)**	**Diet 2 (5%)**	**Diet 3 (10%)**	**Diet 4 (15%)**
Moisture (%)	12.72	10.96^{a}	10.23^{a}	10.17^{b}	9.65^{b}
Crude protein (%)	60.23	66.12^{c}	66.56^{b}	67.33^{a}	67.86^{a}
Lipids (%)	6.24	5.24^{c}	7.63^{a}	4.10^{a}	6.43^{b}
Ash (%)	10.75	12.97^{a}	8.78^{c}	10.97^{b}	12.35^{a}
Crude fibre (%)	0.70	1.01^{b}	0.79^{c}	1.06^{b}	1.23^{a}
Nitrogen extract (%)	9.36	3.71^{b}	6.02^{a}	6.40^{a}	2.40^{b}
Mortality (%)		14.00	52.00	52.00	43.00

Means with same superscript are not significantly different.

Moisture content for diet I (control) and diet 2 (5%AILM) were significantly ($p<0.05$) higher than those of diets 3 and 4. Crude protein of fish on dietary treatments diets 3 and 4 (10%AILM and 15%AILM respectively) were significantly ($P<0.05$) higher than those on diets 1 and 2. Lipids was

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significantly (P<0.05) highest in fish on diet 2 while Ash content was significantly (P<0.05) superior for fish on diets 1 and 3.

Organoleptic assessment scores for both fresh and cooked fish samples of the treatments are presented in tables 5 and 6 respectively.

Table 5: Organoleptic assessment of fresh fish fed levels of AILM

Independent observations

Treatment	1	2	3	4	5	Means
Diet 1 (0%)	1.07	1.31	1.38	1.61	1.46	1.37[a]
Diet 2 (5%)	1.54	2.00	1.54	1.62	1.62	1.55[b]
Diet3 (10%	1.62	1.92	1.38	1.53	1.38	1.57[b]
Diet4 (15%	1.92	1.77	1.38	1.46	1.23	1.55[b]

Means with same superscript are not significantly different.

Table 6: Organoleptic assessment of cooked fish fed levels of AILM

Independent observations

Treatment	1	2	3	4	5	Means
Diet 1 (0%)	2.15	2.30	2.46	2.85	2.77	2.51[a]
Diet 2 (5%)	3.15	2.54	2.62	3.08	2,69	2.81[b]
Diet3 (10%	3.00	2.85	2.69	3.15	2.62	2.86[b]
Diet4 (15%	2.85	3.31	2.85	3.23	2.62	2.97[b]

Means with same superscript are not significantly different.

Fish on all dietary treatments were of good quality as shown in their men scores both of fresh and cooked samples. Fish on 0%AILM dietary treatment were however significantly (P<0.05) superior to fish on other dietary treatments both for fresh and cooked samples.

Discussions and Conclusion

Azadirachta indica leaf meal with upto 20.37% crude protein appears to be a promising ingredient for fish feed (Table 2). The mortality rate of upto 52% recorded for fish fed diets 2 and 3 was alarming but was not far from the

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mortality recorded by Ochang *et a*l (2007). The water quality condition recorded throughout the experimental period (Table 3) was within the optimum condition reported by Anyanwu (2005). Carcass compositions of fish were significantly different across treatments and in all parameters (Table 4). Crude protein interestingly increased with increase in leaf meal inclusion and was significantly higher in fish fed diets 3 and 4. This is an indication that AILM contains essential nutrients capable of producing fish of better crude protein content compared to those fed the control diet. This trend with regard to crude protein content is better than the performance of fish fed Duck weed (Yilmaz *et al* 2004) and commercial trout feeds (Okumus and Mazlum 2002). Crude fibre was markedly highest in fish fed diet 3 while moisture content was least in same diet. The high fibre content of fish fed diet 4 could be attributed to the high fibre content of the leaf mean, which is usually the case with most leaf meals. Lipids and ash contents of fish were significantly different across treatments. Lipids content was significantly highest in fish fed diet 2 while the ash content was significantly highest in fish fed diet 1 and 4. The result appears different from that obtained with the use of alfalfa meal, in which there were no significant differences in body moisture and lipids. The level of alfalfa meal in fish diets did not also affect body crude protein and ash content (Ali, et al 2003). Moreso, the result obtained with the use of sweet potato leaf meal in fish diets, showed no significant differences in carcass composition (Adewolu, 2008). From the above, it appears that AILM performed better than both alfalfa and sweet potato leaf meals respectively.

The quality of both fresh and cooked fish was slightly affected by leaf meal inclusion levels (Table 5 and 6). The organoleptic assessment shows significant superiority of fish fed on diet 1 (0%) to those fed other diets both for fresh and cooked fish. However, the mean scores of fish for the treatments were within the acceptable range for very good quality fish. This

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varies slightly from the findings of Ochang et al (2007) in which there were no significant differences in the quality of both fresh and cooked fish.

In conclusion, the finding of this study reveals that *Azadirachta indica* leaf meal has slightly strong potential as feed ingredient in the diet of *Clarias gariepinus* without grossly affecting the fish quality.

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