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GROWTH AND NUTRIENT UTILIZATION OF *HETEROCLARIAS* (*H. BIDORSALIS X C. GARIEPINUS*) FED DIETARY LEVELS OF *ALCHORNIA CORDIFOLIA* LEAF MEAL

ANYANWU[a], D.C. AND UDEDIBIE[b], A.B.I. OSUIGWE[c], D.I and ESONU[b], B.O
[a]Department of Agricultural. Science, Alvan Ikoku College of Education, Owerri, Nigeria.
[b]Department of Animal Science and Technology,
Federal University of Technology, Owerri, Nigeria.
[c]Department of Biotechnology , Federal University of Technology, Owerri, Nigeria
Corresponding author's Email: ahamefula_dan@yahoo.com

ABSTRACT
The experiment was carried out to determine the effect of dietary levels of Alchornia cordifolia leaf meal on the growth and nutrient utilization of Heteroclarias (H. bidorsalis x C. gariepinus) post fingerlings. 35% isonitrogenous dietary levels of 0%, 5%, 10%, 15% and 20% Alchornia cordifolia leaf meal were formulated. These were fed to 225 post fingerlings of Heteroclarias, randomly assigned to 5 treatments – TCN, TA_1, TA_2, TA_3 and TA_4 in 3 replicates of 15 post fingerlings each using 15 plastic aquaria (250 x 150cm). The fishes were fed twice daily at 5% body weight within the experimental period of 56days. Growth and nutrient utilization of the experimental fishes were determined. The specific growth rate, protein efficiency ratio, and feed conversion ratio of the control were significantly ($p<0.05$) better than those of other dietary treatments of Alchornia cordifolia leaf meal. The daily protein intake was similar for all the treatments, except for TA_2 which was significantly ($p<0.05$) the least. The results of the experiment revealed that ACLM had no significant nutritional attribute as feedstuff in the diets of post fingerlings of Heteroclarias.

Key words: nutrient utilization, *heteroclarias,* dietary levels, *alchornia cordifolia* leaf meal

INTRODUCTION
Most tropical browse plants widely used in feeding ruminants, for example *Alchornia cordifolia* have been successfully fed in poultry (Udedibie and Opara, 1998). This is so, since most of these non-conventional feed resources of plant origin contain some measurable levels of nutrients which could be explored (Okoli *et al*, 2003; Abioye *et al*, 1993), even in the diets for fish. The potentials of non-conventional feed resources as viable and economic sources of feedstuff for fish feed manufacture, according to Madu *et al*, (2003) cannot be overemphasized. They are available, cheap and are not competed for with human beings, hence their optimum utilization may seem more economically viable, attractive and sustainable. It is against this background that this study on determining the effects of feeding dietary levels of *Alchornia cordifolia* leaf meal on post fingerlings of *Heteroclarias* (*H. bidorsalis x C. gariepinus*) was designed.

MATERIALS AND METHODS
The experiment was carried out at the livestock pilot consult farm, Owerri, Imo State. A total of 15 plastic aquaria (250cm x 150cm), covered with mosquito mesh nylon screen to prevent fish from jumping out and possible predation. The tanks were kept in the farm's fisheries house of about 8 x 6m^2. The *Alchornia* leaves were harvested from the bushes at the outskirt of the Owerri capital territory, along Owerri/Onitsha Road, Imo State, Nigeria. These were spread under the sun and dried for three days until they became crispy while still retaining the green colouration. The dry leaves were milled, using a hammer mill to produce to leaf meal.

The leaf meal was used to make four 35%CP Isonitrogenous diets at the inclusion levels of 5%, 10%, 15%, and 20% for TA_1, TA_2, TA_3, and TA_4 respectively. Maize was used as the

major source of energy in the diets, while soyabean meal and fish meal as major sources of protein (Table 1), besides, the use of lysine and methionine at 0.2% levels of inclusion. 1% bone meal was used, Vitamin/mineral premix and common salt at 0.5% levels of inclusion, as main sources of vitamins and minerals. Cassava starch was used at 2% level of inclusion as a binding material. The feedstuffs were finely ground and mixed into a dough form in a plastic bowl using hot water. The mixture was then pelleted by passing through a mincer of 2mm die to produce 2mm diameter size of the pellets. The pellets were then sundried to about 10% moisture content, packed in polythene bags and kept safely dry for use.

Two hundred and twenty-five post fingerlings of *Heteroclarias* collected from the African Regional Aquaculture Centre (ARAC) fish farm, Port Harcourt were stocked in an experimental tank for acclimatization. The fish were acclimatized for 7 days during which they were fed with the control diet containing 35% crude protein, and of zero *Alchornia cordifolia* leaf meal twice daily, 08.00 – 09.00hrs and 17.00 – 18.00hrs. At the end of the acclimatization period, the 225 post fingerlings were completely randomized in 3 replicates of 15 post fingerlings per replicate for the 5 treatments – TCN (Control), TA_1, TA_2, TA_3 and TA_4. The initial weight of fish in each 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 (08.00 – 09.00hrs) and evening (17.00 – 18.00hrs).

Subsequently, body weight measurements were taken biweekly, and rations fed were adjusted according to fish weight gain. The water in the aquaria was regularly monitored for the physico-chemical properties and was 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) methods and Kekeocha (2001). Growth and nutrient utilization index were calculated according to Brown (1957) and A.O.A.C. (1990) methods. Experimental 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.

RESULTS

The proximate composition for the *Alchornia cordifolia* leaf meal were 19.02%, 4.50%, 6.30%, 14.30%, 47.13% and 8.75% for crude protein, ash, lipids, crude fibre, nitrogen free extract and dry matter respectively. Water quality condition in the experimental aquaria of mean values 26.09 ± 0.01^{0}C, 6.30 ± 0.09 and 4.93 ± 0.07mg/l for temperature, pH and dissolved oxygen respectively, showed little variations throughout the experimental duration.

The growth and nutrient utilization responses of *Heteroclarias* (*H. bidorsalis x C. gariepinus*) fed varied dietary levels of *Alchornia cordifolia* leaf meal is summarized in table 3. The initial body weight, final body weight and increase in body weight of the fish for the treatments ranged from 9.02g – 12.20g, 11.84g –29.24g and 2.82g – 18.48g respectively, with the control achieving the highest increase in body weight (18.48g) and TA_2 (2.82g), the least body weight within the experimental period of 56 days. The specific growth rate of 1.81g/d for TCN was significantly ($p<0.05$) higher than TA_1 (0.64g/d), TA_2 (0.46g/d), TA_3 (0.44g/d) and TA_4 (0.51g/d).

The daily protein intake of 0.29g for TCN was not different ($p>0.05$) from TA_1 (0.24g), TA_3 (0.24g) and TA_4 (0.23g), but significantly higher ($p<0.05$) than TA_2 (0.18g). The protein efficiency ratio of the fish on TCN (1.23) was significantly higher ($p<0.05$) than TA_1 (0.38), TA_2 (0.31), TA_3 (0.27) and TA_4 (0.32). The feed conversion ratio of TCN (3.19)

was significantly ($p<0.05$) better than for all the dietary levels of ACLM, TA_1 (19.09), TA_2 (13.87), TA_3 (20.48) and TA_4 (14.18).

DISCUSSION

The proximate composition of ACLM revealed very low level of ash, but high level of crude fibre, a feature that is very common with leaf meals. The values agree with result reported by Udedibie and Opara (1998). The metabolizable energy value of the diets decreased with increased levels of the leaf meal (Table 2), suggesting the low energy status of ACLM. The mean values for the water conditions of the experimental aquaria fall within the optimum requirements for normal fish growth and nutrient utilization (Anyanwu, 2005 and Ochang *et al*, 2007). The result of the experiment showed increase in body weight of the fish, TCN (18.48g) as the highest, while TA_2 (2.82g) was the least. The specific growth rate of the fish on TCN (1.81gld) was significantly higher ($p<0.05$) than the rest of the treatments. This might be an indication that the nutrients were best converted to flesh by the fish on diet TCN than those on other dietary treatments. This confirms the works of Dada *et al* (2001) and Fagbenro and Jauncey (1994), reporting varied nutrient levels to affect growth responses of fish. Leaf meals, however, apparently contain sufficient levels of all minerals to meet recommended requirement for animals, but their energy content is generally low (NRC, 1978; D'Mello and Acamovic, 1982). The trend in the Specific Growth Rate (SGR) of the experimental fish might be an indication of their relative responses to the varied levels of inclusion of the test feedstuff, *Alchornia cordifolia leaf* meal, in the feeding trial.

The value of 0.27 – 1.23 reported for protein efficiency ratio (PER), slightly compared well with the range of 0.27 – 0.79 and 0.57 – 1.47 reported by Wing-keong *et al* (2004) and Alegbeleye *et al* (2001) for varying levels of jackbean meal. PER was reported to decrease with increase in the inclusion level of jackbean. The feed conversion ratio (FCR) of 3.19 observed for the control treatment TCN), and a range of 13.87 – 20.48 for other treatments might suggest the very poor influence of the test feedstuff, *Alchornia cordifolia* leaf meal on the experimental fish. With higher values of FCR, there seemed to be a decrease in the SGR values of the experimental fish and the overall yield. FCR value however varied from 3.21 – 8.7 in various trials using species of fish, particularly catfish (Madu and Akilo, 2001, Madu *et al*, 2001; Osuigwe *et al*, 2006; Ochang *et al* 2007). Udedibie and Opara (1998) in their studies on poultry, reported that mean growth rate and feed/gain ratio of the chicks fed diets containing 25g and 50g/kg ACLM compared favourably ($p>0.05$) with those of control, but significantly ($p<0.05$) depressed at 75g/kg and 100g/kg ACLM dietary levels, respectively. The inclusion levels of *Alchornia cordifolia* leaf meal in this study generally had a deleterious effect on the general performance of the fish, with the control treatment (TCN), achieving the highest body weight and a significantly ($p<0.05$) better growth performance than other treatments of *Alchornia cordifolia* leaf meal dietary levels.

CONCLUSION

The specific growth rate, protein efficiency ratio and feed conversion ratio of the post fingerlings fed the control diet were significantly ($p<0.05$) higher than those fed on dietary levels of *Alchornia cordifolia* leaf meal. ACLM therefore, seemed to have no strong nutritional attribute as feed ingredient in the diets of *Heteroclarias* post fingerlings.

Table 1: Experimental Diets using *Alchornia cordifolia* leaf meal (ACLM)

Dietary levels of ACLM					
Ingredients	**0%**	**5%**	**10%**	**15%**	**20%**
Maize	30.6	25.5	22.9	19.1	15.3

Fish meal	19.0	19.0	19.0	19.0	19.0
Soyabean meal	45.0	44.1	42.7	41.5	40.3
ACLM	0.0	5.0	10.0	15.0	20.0
Cassava starch	2.0	2.0	2.0	2.0	2.0
Palm oil	1.0	1.0	1.0	1.0	1.0
Bone meal	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./min premix *	0.5	0.5	0.5	0.5	0.5
Common salt	0.5	0.5	0.5	0.5	0.5
	100.00	100.00	100.00	100.00	100.00

Table 2: Chemical composition

Crude protein (%)	34.98	35.08	35.02	34.95	35.1
Crude fibre (%)	2.93	3.56	4.13	4.70	5.33
Esther Extract (%)	7.35	7.43	7.54	7.65	7.72
Ash (%)	13.70	13.44	12.60	11.87	11.50
ME (Kcal/kg)	3244.74	3206.62	3169.64	3132.14	3094.64

Table 3: Growth and Nutrient utilization Responses of *Heteroclarias* (*Heterobranchus* bidorsalis x *Clarias gariepinus*) fingerlings fed varied levels of *A. cordifolia* leaf meal.

Variable parameters	**Dietary levels of *A. cordofolia***					**SEM**
	TCN(0%)	TA_1(5%)	TA_2(10%)	TA_3(15%)	TA_4(20%)	
Initial weight (g)	10.76	11.90	9.02	12.20	11.82	0.26
Final weight (g)	29.24	16.63	11.84	15.55	15.63	1.33
Increase in body wt (g)	18.48	4.73	2.82	3.35	3.81	1.33
Feed Intake (g/day)	0.82^{a}	0.68^{ab}	0.51^{b}	0.68^{ab}	0.65^{b}	0.02
Specific growth rate (g/day)	1.81^{a}	0.64^{b}	0.46^{b}	0.44^{b}	0.51^{b}	0.13
Daily protein intake (g)	0.29^{a}	0.24^{ab}	0.18^{b}	0.24^{ab}	0.23^{ab}	0.03
Protein efficiency ratio (PER)	1.23^{a}	0.38^{b}	0.31^{b}	0.27^{b}	0.32^{b}	0.08
Mortality (%)	8.88^{b}	4.44^{c}	8.88^{b}	8.88^{b}	17.77^{a}	1.94
Feed conversion ratio (FCR)	3.19^{a}	19.09^{b}	13.87^{b}	20.48^{b}	14.18^{b}	5.6

$^{a, b, c, d}$ Means within a row with different superscripts are significantly different ($p< 0.05$)

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