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RESPONSE OF CONCRETE POND-RAISED *CLARIAS GARIEPINUS* FED DIETS CONTAINING DIFFERENT INCLUSION LEVELS OF COW TRIPE EPITHELIAL WASTE

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ABSTRACT

The study examined the effect of Cow Tripe Epithelial Waste (CTEW) on the growth performance, nutrient utilization and survival of advanced fry *Clarias gariepinus* raised in ten homestead tanks (3m x 1.5m x 0.06m) for ten weeks. Each tank was stocked with 100 advanced fry with initial average weight of 0.68 $\pm$ 0.55g. The diets were isonitrogenous 40% crude protein and iso-caloric (3.47 $\pm$ 1.24Kcal/g). The fish were fed the equivalent of 5% of their body weight twice daily. The weights of feed were adjusted after bimonthly weighing. The water parameters were monitored at the commencement and weekly subsequently. The design of the experiment was completely randomized.

The results show that percentage survival, Gross Efficiency Food Conversion (GEFCR) and weight gain were best in the fish fed diet with 25% CTEW replacement. The growth utilization (GEFCR) parameter evaluated was higher in fish fed the diet containing 25% CTEW replacement than those obtained in the control. The Food Conversion Ratio (FCR) of the advanced fry fed the control and diets 1, 2 and 4 were not significantly different ($p < 0.05$). However, the percentage Specific Growth Rate (SGR) improved with increasing CTEW inclusion. It implies that the CTEW protein could qualitatively replace fishmeal in the diets of *Clarias gariepinus* advanced fry raised in homestead ponds. This is therefore recommended for inclusion in the diets of *C. gariepinus* for faster growth and better health management.

INTRODUCTION

One of the major constraints of aquaculture in Nigeria is the inadequate and insufficient supply of suitable plant and animal protein fish feed (Tewe, 1985). The plant proteins that are available are competed for as food by man (Smith *et al.* 1980) and generally when fed to fish, there is a reduction in growth and feed utilization (Hossain and Jauncey 1989; Tacon 1997 and Olukunle and Falaye, 2000). Animal protein sources such as fishmeal and artemia are expensive. Fish itself is a valued source of food for man, hence the need to evaluate the inclusion of potential animal waste which is relatively cheaper in the feed of *C. gariepinus,* a widely acceptable tropical fish species in Nigeria. This study, therefore investigated the nutritional potentials of cow tripe epithelial (CTEW) in the feed of advanced fry of *C. gariepinus* reared in homestead ponds.

METHODOLOGY

Ten concrete tanks, each 3m x 15m x 0.6m, were used to conduct the experiment. Two of these were used for control while the remaining eight were used for the treatments. Water was introduced into the tanks from the municipal water supply and allowed to fallow for 4 days. Each tank was stocked with 100 advanced fry (mean weight 0.68g $\pm$ 0.55g) obtained from Oyo State Fisheries Department, Ibadan. The water was changed completely every two weeks throughout the period of the experiment. Fresh cow tripe epithelial waste (CTEW) was collected at the nearest abattoir, in Bodija market, Ibadan, sun-dried to constant weight, ground and sieved into fine particles (less than 0.1mm). The diets were compounded as shown in Table 1. The compounded diets were pelleted, sun-dried and stored at – 18^0C till required. On introduction into the tanks, the fry were starved for 24 hours and thereafter acclimatized by feeding them with the control diet. The fish were fed thrice daily (8.00; 12.00 and 16.00 hrs) at a feeding rate of 5% of their total body weight. Bimonthly weighing of the advanced fry was done and weight of feed adjusted accordingly. Proximate analyses of dried CTEW, the treatment diets and carcasses of the fry were carried out as described by A.O.A.C., (1991) while the water parameters were monitored as described by Boyd (1982). The data were analyzed using ANOVA.

Water Analysis

Dissolved Oxygen (DO)

DO level in the water was measured in the experimental tanks with a portable Clandon JS1 model 57 Oxygen meter.

Temperature

Temperature was measured using a mercury thermometer.

Ammonia, Nitrite and Nitrate

The ammonia; nitrite and nitrate concentrations were measured with easy-test water analytical kit (Interpret Ltd. Dorking, Surrey, England).

pH

The hydrogen concentration (pH) was measured by means of an easy-test water pH meter (King British Company, Bradford England).

Analysis of Fish Growth and Feed Utilization Data

The relevant parameters were obtained as follows ;

(i) Specific Growth Rate = $\dfrac{\log_e W_1 - \log_e W_0}{T_1 - T_0} \times 100$

(ii) Weight gained = Final weight - Initial weight.

(iii) Feed Conversion Rate (FCR) $= \dfrac{\text{Dry feed weight (g)}}{\text{Live weight gain (g)}}$

(iv) Gross Efficiency of Feed Conversion Ratio (GEFCR %) $= \dfrac{1}{FCR} \times \dfrac{100}{1}$

(v) Survival rate % $= \dfrac{\text{No. of fish at } T_0 - \text{No. of fish at } T_1}{\text{No. of fish at } T_0} \times 100$

Statistical Analysis

The data were analyzed using the ANOVA (Stat. General MANOVA software) followed by LSD test on homogenous groups.

Table 1: Composition of the test-diets fed *C. gariepinus*

Ingredients	Control	Test Diets		
	0% (CTEW) (g)	25%(CTEW) (g)	75%(CTEW) (g)	100%(CTEW) (g)
Yellow maize	20.49	20.49	20.49	20.49
Wheat bran	20.49	20.49	20.49	20.49
Fish meal	56.03	42.02	14.01	0.00
Cow tripe-epithelial waste	6.00	14.01	42.02	56.03
Bone meal	1.50	1.50	1.50	1.50
Vitamin premix[1] (Poultry Growers concentrate)	1.00	1.00	1.00	1.00
Salt	0.50	0.50	0.50	0.50

[1]Composition of Vitamin premix (g/100g of mix) – Thiamine 0.198g; riboflavin 0.76g pyridoxine 0.178g; Panthoenic acid 3.94g; inositol 7.1g; Folic acid 0.054g; Choline 32.24g; Niacin 2.66g; B12 0.334mg; E 1.417g; C 3.934g; K 0.07g; Rovimix ++ 1.744g; Cellulose 43.84g.

Table 2 –Proximate Composition of Experimental Diets

	Control	Treatments 1	2	3
% Crude Protein	40.09	30.75	40.10	40.10
% Crude fiber	3.61	3.95	4.12	5.34
% Moisture	8.36	9.98	9.16	6.60
%Ash	5.19	5.86	6.63	7.77
% Crude Lipid	4.16	4.83	4.96	5.47
% Nitrogen Free Extract	38.59	35.65	35.03	34.72
Calculated Metabolizable Energy, ME (Kcal/g)	3.51	3.45	3.50	3.43

Table 3 - Proximate Composition of Carcass of the Experimental Fish

	Initial	Control	Treatments 1	2	3
Dry matter	95.27	98.61	96.67	96.60	97.13
% Crude Protein	57.29	61.83	66.03	68.42	74.88
% Crude fiber	13.59	10.23	11.25	11.86	9.37
% Ash	7.25	5.39	6.03	6.10	6.67
% Crude Lipid	4.18	3.41	4.18	4.41	4.71
Nitrogen Free Extract	12.95	16.03	9.18	5.99	1.52

RESULTS AND DISCUSSION

Results of the proximate analysis of CTEW show it contained 60.15%CP, 11.49% crude fiber, 8.82% crude lipid, and 14.88% ash with a moisture content of 4.68%.

CTEW or rumen epithelial waste (REW) or digester is a waste product from per-boiling and scraping the fore stomach of slaughtered cattle. Its disposal is a problem for the local government council agencies. Information on the nutritional value of REW as a possible feed ingredient in fish nutrition is scarce.

The water quality parameters monitored were within the normal ranges (Boyd, 1982). Temperatures ranged from 29 – 30^{0}C $\pm$ 2^{0}C; nitrite below 0.03ppm; ammonia less than

0.05ppm; ammonium ions less than 9.00ppm and pH from 6 – 8 and dissolved oxygen rarely below 6ppm.

For a long time in the history of fish nursery management, fishmeal and life artemia have been the commonest sources of protein for raising fry to fingerlings. The crude protein contents of fishmeal and artemia range from 60 – 72% (Gohls, 1981). The above composition of CTEW highlights the possibility of CTEW as a potential candidate for replacing fish meal in fish feed diet especially in fish nursery management.

The use of REW in fish feeding is environment friendly. It does not present any disposal problem rather it is actually a solution. In addition, it enhances the production of quality flesh of catfish in this instance. The use of REW could be a solution to the problem of survival of fry to fingerling stage of carnivorous fish species that has remained intracable in fish nursery management for a long time. It supported faster growth of the fry in this research.

The proximate composition of the carcass of all fish fed the test diets are shown in (Table 3). All the fish fed the graded diet showed high weight gain. Table 4 reflects the observed growth performance; nutrient utilization and survival of the test fish fed the varying inclusion levels of REW. The high percentage SGR; the low FCR and the high survival rate especially on Diet 2 having 25% replacement of fishmeal with CTEW confirms CTEW to be rich in utilizable crude protein. All the growth parameters (SGR, weight gain) reflect a significant ($P < 0.05$) improvement over those of the fish fed control diet (Table 4 and Fig. 1). Equally, the nutrient utilization factors (FCR and GEFCR) also mirror the positive effect of the addition of REW to the test diets over the control. Fig. 2 shows the improved average feed intake of the test diets over the control. The GEFCR of diet 2 (91.30%) clearly shows that the test fish optimally utilized this diet. The FCR of test diet 2 (1.23) is insignificantly ($P < 0.05$) different from the control (1.21) and also reflects optimal conversion of the diets to fish flesh. Actually, the presence of REW enhanced and lowered the FCR of all the test diets. Omitoyin and Faturoti (2002) equally observed a similar trend whereby the 25, 50, 75% replacements of fishmeal by processed chicken offal performed significantly ($P < 0.05$) better than the control in the diets of *C. gariepinus* fingerlings. The control diet in the latter and this research utilized fishmeal as the source of crude protein. Olukunle *et al*. (2002) and Olaniran (1991) observed an impaired crude protein utilization and attendant reduction in growth with increasing levels of cow blood and processed feather meal inclusion in the diets of catfish. Hematological and plasma enzyme analyses reveal progressive severe anemia and enzymatic changes that imply liver, kidney, and/or cardiac damage and opportunistic systemic bacterial infection in the latter researches.

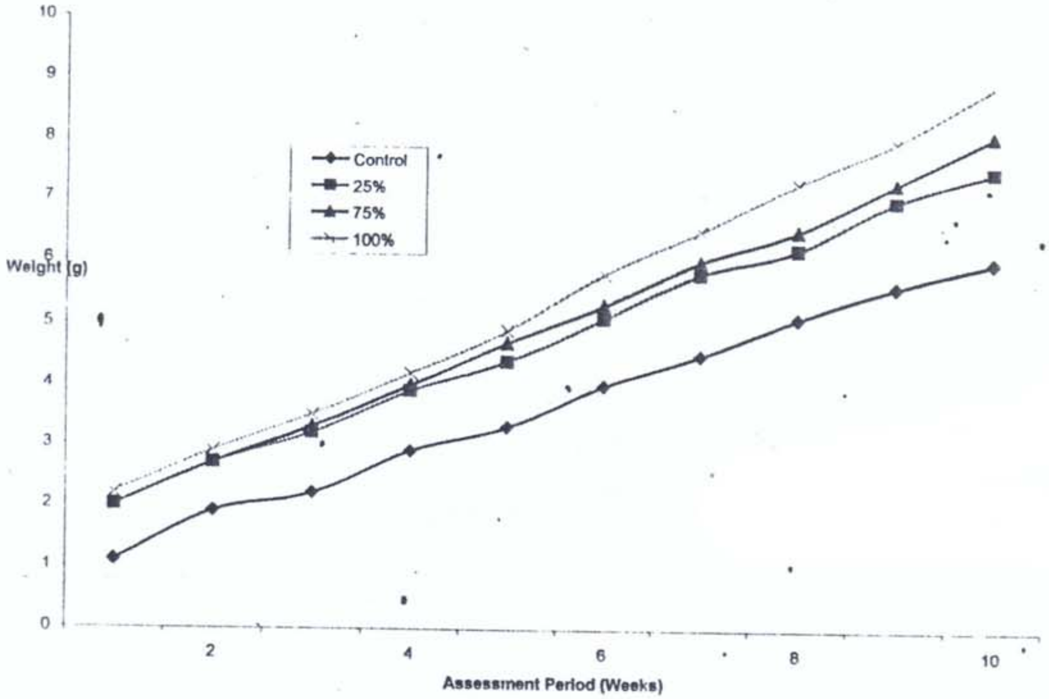

Fig. 1: Weekly average increase in weight per fingerling of *Clarias gariepinus*

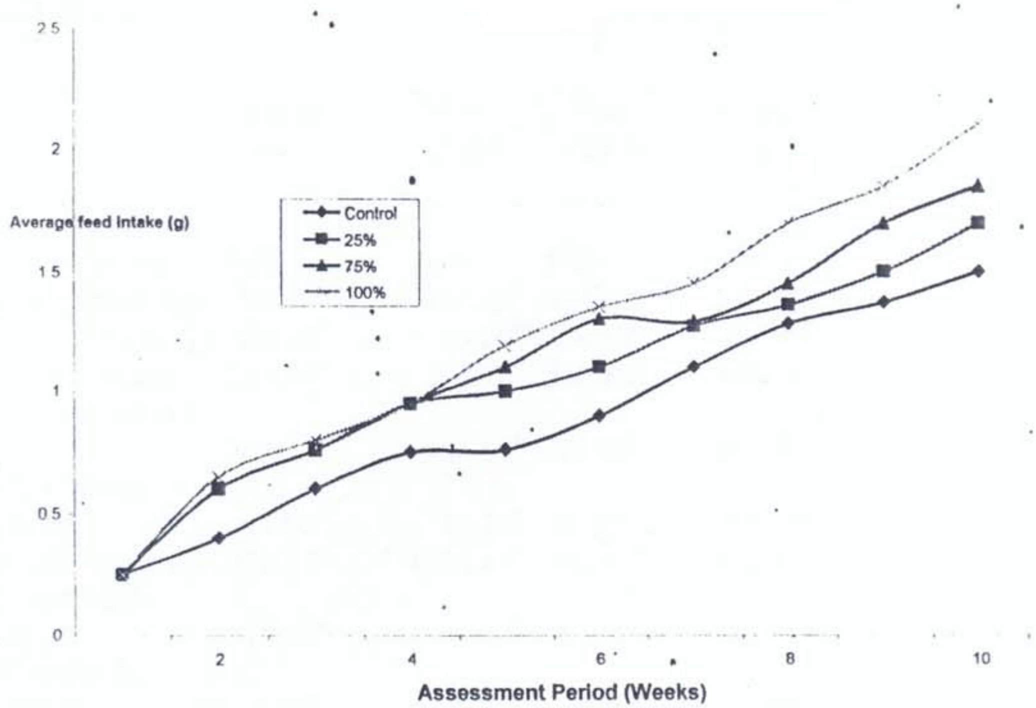

Fig 2: Weekly average feed intake per fingerling *Clarias gariepinus*

Table 4: Growth Performance, nutrient utilization and survival of *C. gariepinus* advanced fry fed varying inclusion levels of cow tripe epithelial waste (CTEW)

		1	2	3
Diets	Control Tank	25% CTEW	75% CTEW	100% CTEW
Av. No. of fish Stocked/treatment	100	100	100	100
Final Av. Weight (g)	594.79[a]	751.22[b]	644.35[d]	686.98[c]
Initial Av. Weight (g)	69.00[a]	68.50[ab]	68.15[ab]	68.80[b]
Av. Weight gained	525.79[a]	682.72[b]	576.18[d]	528.18[c]
Body weight gained (g)	764.32[a]	996.67[b]	837.98[d]	817.79[c]
Specific Growth Rate (SGR)	14.06[a]	16.14[b]	17.53[d]	18.69[c]
Total Feed Intake (g)	922.13[a]	1225.14[b]	1143.52[d]	1155.31[c]
Total Feed Intake Per fish (g)	10.15[a]	12.64[b]	13.20[d]	12.45[c]
Feed Conversion Ratio (FCR)	1.21[a]	1.23[a]	1.36[b]	1.24[c]
Gross Efficiency of Food Conversion Ratio GEFCR (%)	82.65[a]	91.30[c]	75.76[d]	79.37[c]
Mortality	15	5	25	25
Survival Rate %	85	95	75	75

a,b,c - Values along the same row with different superscripts differ significantly from their respective mean values ($P < 0.05$).

REFERENCES

A.O.A.C. (1991). W. Horwitz (Editor). *Official Methods of Analytical Chemists. Official Method of Analysis*. 12th Edition. Washington DC. 1091pp.

Boyd, C.E. (1982): Water Quality Management for Pond Fish Culture Development in Agriculture and Fisheries Science. 359pp.

Olukunle, O.A. and Falaye, A.E. (2000): Utilization of autoclaved solvent extracted sesame seed cake as a cheaper source of methionine supplementation to other plant protein sources in the feed of *Clarias gariepinus*. *J. of West African Fish* Vol. IX: 507 – 513.

Gohls, G. (1981): *Tropical feeds. Feed information and Nutritive values.* Animal Production and Health Series, 1981, F.A.O. Rome.

Hossain, M.A. and Jauncey, K. (1989): Nutritional evaluation of some Bangladeshi oilseed meals as partial substitutes for fishmeal in the diet of common carp. *Cyprinus carpio L. Aquacult. Fish. Manage.* 225 – 268.

Olaniran, T.S. (1991): Performance of hybrid Red Tilapia (*Oreochromis aureus X 0...*) fed varying levels of processed feather meal-based diets. M.Sc. dissertation (Unpublished) of Univ. of Ibadan.

Olukunle, O.A., Ogunsanmi, A.O., Taiwo, V.O. and Samuel, (2002): The nutritional value of cow blood meal and its effects on growth performance, hematology and plasma enzymes of hybrid catfish. *Trop. J. Anim. Sci.* 5(1): 75 – 85 (2002), ISSN: 1119-4308.

Omitoyin, B.O. and E.O. Faturoti (2002): Evaluation of chicken offal meal (COM) as protein source for African catfish, *Clarias gariepinus* fingerlings raised in earthen pond. *J. of W. African Fisheries* Vol. IX: 488 – 495.

Smith, L.W., Thomas, A.B. and Carr, A.B. (1980): Resources and Environment. *In*: Pond NG. R.A. Marked: L.D. Mcgilliard and V.J. Rhodes (eds). *Animal Agriculture Research to meet human needs in the 21st Century*, West view Press, Boulder, Colorado, USA.

Tacon, A.G.J. (1997): Fish meal replacers: Review of anti-nutrients within oilseeds and pulses – a limiting factor for the aqua feed Green Revolution? In: Tacon, A., Basurco, B. (Eds.), Feeding Tomorrow's Fish. Proceedings of the Workshop of the CIHEAM Network on CIHEAM, FAO and IEO, 24 – 26 June 1996, Mazarron, Spain Cashiers – Options – Mediterraneenes Vol. 22 pp. 153 – 182.

Tewe, O. (1985): Waste product utilization for the animal feed industry. Invited Paper presented at Nigeria Inst. of Fed. Sci. and Tech, NIST. National Conference on "Devt. of New Food products from readily available local raw materials 24th – 27th Sept. 1985, held at FIIRO, Oshodi, Lagos.