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Effect of smoked fish waste meal on growth response and fish production of African mudfish (Burchell, 1822): An economic implication in Nigeria

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Abstract
The increasing need for livestock feed concentrates in Nigeria cannot be over- emphasized. The increase cost of fish meal and its future availability have made it imperative for the aquaculture industry to reduce or remove fish meal from fish diets when possible. In the present study, growth response, feed efficiency parameters and cost implications were determined. The mean weight gains and total feed fed were significant across the treatments following unique trend pattern of direct proportion to inclusion levels ($p<0.05$). Total protein intake, feed conversion ratio, protein efficiency ratio and total fish production were all significantly different across treatments /diets ($p<0.05$). The protein efficiency ratio was highest in diet 5 (90.18) with optimum fish yields of 21.50kg/m^3. Economically, the fish feed consumed and weight gained show that, the fish body weight increases with decreases in cost incurred per body weight as the inclusion level of the substitute increases.

Keywords: Feed utilization, efficiency, growth parameters, palatability, ingestion and economic viability

Introduction
Aquaculture as a sub-sector of fisheries technology is designed principally for fish production at a sustainable level. Its capture fisheries counterpart evidently suffers ripple pressure of exogenous factors beyond the ecosystem limit. The bridging role of aquaculture between fish supply and fish demand is threatened by the variable cost of production in terms of provision of high quality feed for survival, growth and business viability. This agricultural sub-sector is growing fast world- wide. This development largely depends on imported fish meal (IFM) that is considered the most desirable animal protein. The most costly ingredient is fish meal, due to high protein concentration, balanced basic units of protein (amino acids), high digestibility and palatability and as a source of essential n-3 polyenoic fatty acids. The tropical region is indeed in the fish meal trap situation in which the ocean stocks is diminishing by over fishing and at the same time the demand for fish meal increases [1].
Globally, fish meal production is approximately 6-7 million tonnes per year [2]. In aqua business, maximizing profit is ultimate for sustainable fish production. The incessant increasing total demand for imported fish meal use in animal feed industry particularly in aqua business has led to fish meal becoming extremely difficult to obtain and more expensive. As a result, the search for alternatives to imported fish meal is an international research priority [3-5]. Despite the fact that substantial of fishery by-products and by- catch are produced annually in the world, little attention has been paid to their commercial usage for *Clarias gariepinus* [6].
Fish smoking industry produce huge waste capable of littering the environment and ultimately constitute to environmental menace; instead the rich in protein source –waste may be used as a replacement for fish meal in fish diet. Feed alone account for at least 60% of total cost of fish production and the nutrient composition of feed influences feed utilization and ultimately the growth of fish. Given that feed is the highest recurring cost in catfish culture. Feed trials have been carried out on *Clarias gariepinus* growth response to different readily available local plant and animal protein sources [7-16]. The research has focused on utilizing less expensive and readily available resources to replace fish meal, without reducing the nutritional quality of feed [17]. The choice of *Clarias gariepinus* as a test organism for this study is because of its food and feeding habits, tolerance, cultural and social values which currently make catfish the most cultured fish species in Nigeria.

This paper aims at evaluating the fish growth, feed utilization and cost implications on *Clarias gariepinus* juveniles fed practical diets of smoked fish waste meal as a substitute for more costly imported fish meal.

Materials and methods

Experimental Site

The experiment was carried out at the research and training fish farm of Oyo State College of Agriculture and Technology Igboora (OYSCATECH) Nigeria.

Experimental Fish

150 juveniles of *Claris gariepinus* of initial weight of 38.70 ± 0.55g was procured from the University of Ibadan Oyo State, Nigeria. They were acclimated for 5 days prior to the start of the feeding trial to ensure total emptiness of stomach and for stability.

Experimental Design

The experiment had 5 treatments and 3 replicate each in a completely randomized design (CRD). The smoked fish waste was included in the practical diet at 0%, 25%, 50%, 75%, and 100% by weight of the ingredient (SFWM) to replace imported fish meal (IFM) and designated as diet 1, 2, 3, 4 and 5 respectively. Each practical diet was isonitrogenous and isocaloric in nature. Experimental fishes were fed with the experimental diets in 35L rectangular plastic bowls with aeration and diet 1 without SFWM serves as control.

Table 1: Gross composition of the Experimental Diets

Feed Ingredients	Dietary Replacement				
	DT1 (0%)	DT2 25%	DT3 50%	DT4 75%	DT5 100%
SFWM	0.00	12.00	24.00	36.00	48.00
IMP	48.00	36.00	24.00	12.00	0.00
YM	46.00	46.00	46.00	46.00	46.00
Veg. oil	3.00	3.00	3.00	3.00	3.00
Vita. premix	1.00	1.00	1.00	1.00	1.00
Methionine	0.50	0.50	0.50	0.50	0.50
Lysine	0.50	0.50	0.50	0.50	0.50
Dic. Sulphate	0.50	0.50	0.50	0.50	0.50
Salt	0.50	0.50	0.50	0.50	0.50
Total	100	100	100	100	100

Five diets were formulated to contain 40% CP
SFWM------- Smoked fish waste meal
IMP----------- Imported fish meal
YM----------- Yellow Maize
Dic. Sulphate ------------- Dicalcium sulphate

Experimental fish culture

Clarias gariepinus juveniles with initial mean weight of 38.70 ± 0.55g were acclimated for 5 (five) days before the start of the feeding trials. Ten juvenile fish were randomly sampled, stocked in 35L triangular plastic bowls and aerated. Feeding was observed at 3% body weight twice daily between the hours of 8am and 5pm daily. During weekly sampling, fishes were counted and weighed with sensitive scale, feeding was suspended in the morning prior to weighing day.

Monitoring of water quality variables in the receptacle based on treatments was conducted. Temperature was measured twice every day with mercury-in-glass thermometer at 9am and 6pm. Dissolved oxygen by titration methods and pH with pH meter [18].

Nutritional analysis of experimental diets

Experimental diets were randomly sampled, blended into 200 micron mesh sieve, homogenized and stored in airtight containers at -18°C until analyzed by [19]. The crude protein was determined by Kjeldahl Nitrogen, crude lipid by Ether extraction,Total ash by Muffle furnace combustion, Crude fibre by Weede methods, CHO by % NFE equation,

% NFE = 100 – (protein + % lipid + % fibre + % ash) and gross energy

GE = (% NFE x 4.11) + (% protein x 5.64) + (% lipid x 9.44)

Data Collection

Parameters of study were specific growth rate, mean weight gain, feed conversion ratio, percentage weight gain, average weight gain (ADWG), Total feed fed, Total protein intake, protein efficiency ratio.

Mean Weight Gain (MWG) = final weight – initial weight

ADWG =MWG/ Length of feeding trial (days)

% WG= MWG (g) /Initial mean weight x 100

$$SGR\ (\%/day) = \frac{100\ [(\log w2 - \log w1)]}{\text{Cultured period (days)}}$$

Total Protein intake (TPI) = Total feed consumed x % crude protein in feed

Total Feed intake (TFI) = Amount of feed throughout the period of the experiment.

$$\text{Protein gain (PG)} = \frac{\text{MTPI (g)}}{\text{Culture time (days)}}$$

$$PER = \frac{\text{Net weight gain (g)}}{\text{Amount of protein fed (g)}}$$

$$\text{Total fish production} = \frac{\text{Final weight (g) X survival rate}}{1000\ (l)}$$

Note: ADWG= Average daily weight gain
SGR = Specific growth rate

MTPI =Mean total protein intake total feed intake × % crude protein (g))

Results and Discussion

Chemical composition of feed ingredients

The nutrient compositions of feed ingredients were shown in Table 2. The crude protein of imported fish meal (IFM) and smoked fish waste meal (SFWM) value were 72.26 and 68.07 respectively. The total lipid of IFM was highest (14.18) but lower gross energy of 543.66cal/g comparatively with SFWM of 9.57 lipids and 544.12cal/g respectively.

Table 2: Nutrients composition of feed ingredients

Chemical Analysis	Imported fish meal(IFM)	Smoked fish waste meal(SFWM)	Yellow maize(YM)
Dry matter	92.50	93.91	94.48
Crude protein	72.26	68.07	11.83
Total lipids	14.18	9.57	5.47
Ash	11.05	16.85	1.48
Crude fibre	2.17	0.68	15.14
NFE*	0.34	4.83	66.08
GE/100 g diet**	543.66	544.12	389.46
DE/100 g diet***	368.62	323.09	250.91

***Nitrogen- free Extract (calculated by difference) = 100—(protein+ lipid+ ash+ fibre).
****Gross energy (GE) was calculated according to [20] as 5.65, 9.45 and 4.1 kcal/g for protein, lipid and carbohydrates respectively
*****Digestible energy (DE) was calculated according to [21] as 3.5, 2.5 and 8.1 for protein, NFE and lipid kcal/g respectively.

The proximate analysis of feed ingredients used for this study shows that, the substitute (SFWM) gross and digestible energy are adequate towards effecting physiological activities of the test organism (Table 2); and as a result provides ample usage and effective conversion of protein intake to muscle building as reflected in the studied growth response parameters**.** This result agreed with discoveries of [22] on protein – energy ratios.

Physical and chemical water variables

Water is everything to fish. Therefore, this principal medium should be optimally sustained as water variables are concerned. The water chemistry of this study agreed with the standard recommendation for excellent growth response of fish and successful fish farming in the tropics. Table 3 displays water quality parameters observed for this study. These water variables fall within acceptable limit in fish aquaculture [23].

Table 3: Water quality parameters of the Experiment

Parameters	Dietary Replacements				
	0% SFWM	25% SFWM	50% SFWM	75% SFWM	100% SFWM
Temperature	27.58	27.57	27.46	27.56	27.60
DO (mg/l)	6.20	5.40	5.20	4.40	4.80
pH	6.40	6.80	6.70	6.60	6.80
Conductivity (μhom/cm3)	580	420	360	420	440

Table 4: Growth parameters of *Clarias gariepinus* juveniles fed various replacement levels of Smoked fish wastes meal (SFWM)

Parameters	DT1 (0%)	DT2 (25%)	DT3 (50%)	DT4 (75%)	DT5 (100%)	SEM
Initial wt.	38.83	38.36	38.30	38.90	39.10	38.70 ±0.16
Final wt.	53.73	96.98	145.02	172.82	210.46	135.80 ±27.63
Net mean wt.	14.90	58.62	106.72	133.92	171.36	97.10 ±27.57
ADWG	0.35	1.40	2.54	3.19	4.08	2.31 ±0.66
SWG	0.77	2.21	3.17	3.55	4.01	2.74 ±0.58
%WG	38.37	152.82	278.64	344.27	438.26	250.47 ±70.49
TFF	7.73	8.97	10.30	11.00	12.14	10.03 ±0.77
TPI	3.09	3.59	4.12	4.40	4.86	4.01 ±0.31
FCR	5.18	1.53	0.97	0.82	0.71	1.84 ±0.85
PER	12.41	42.57	67.63	78.24	90.18	58.21 ±13.88
TFP (kg/M^3)	5.37	9.05	14.50	17.28	21.50	13.54±2.87
% survival rate	100	93.33	100	100	100	98.67±1.33
Length of study	42	42	42	42	42	

Protein requirement is given high priority in any nutritional study because it is the sole nutrient that is required in large quantity for growth and development and also the most expensive feed formulation ingredient [24, 25]. Variations may occur in individual feed ingredients as a result of their variety, climatic condition and processing methods. The inclusion of hydrolyzed feather meal in the diet of *O. niloticus* by [26] revealed that the feather meal could replace 30% of the expensive fish meal without deleterious effects on fish growth and feed conversion efficiency. Also, earth worm (*Perionyx excavates*) meal incorporated in Tilapia (*O. niloticus*) diets was found to induce more efficient performance in the fish than rations with fish meal as a single dietary protein source [27]. In addition, usage of dried citrus pulp for partial replacement of yellow corn in practical diets of Nile tilapia had been reported by [28].

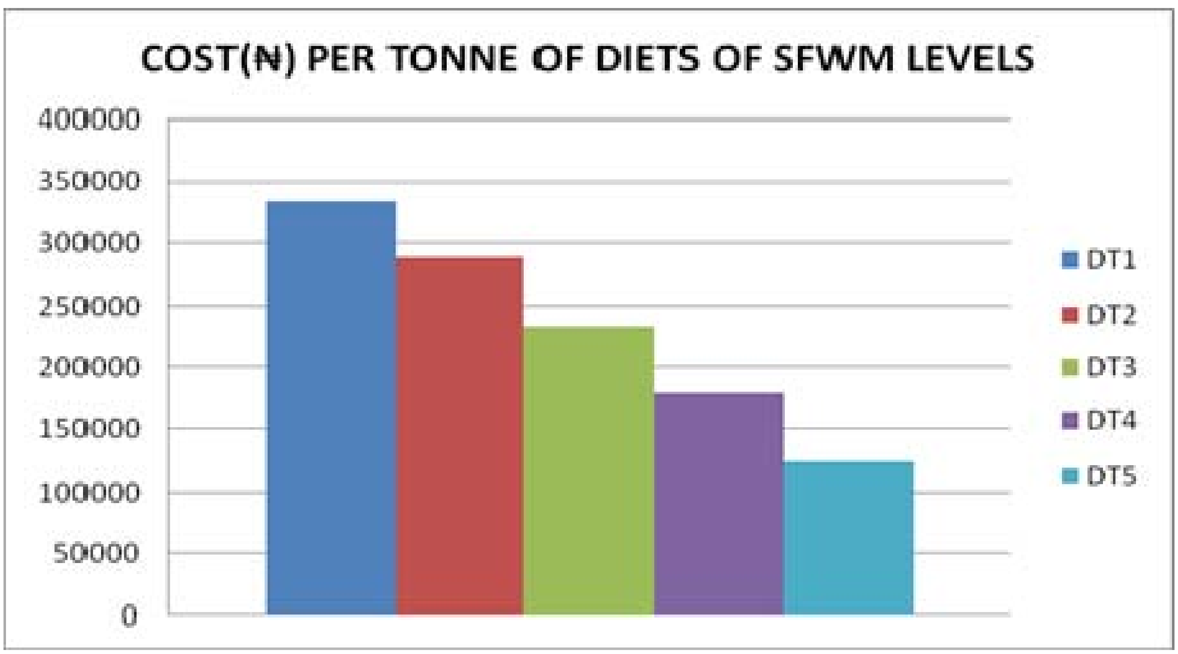
Table 4 shows parameters studied and recorded in the growth performance and nutrient utilization of *Clarias gariepinus* at replacement levels of 0%, 25%, 50% 75% and 100% of smoked fish wastes meal in the diets. The mean weight gains across the treatments were significantly different ($p<0.05$). The highest weight gained was 171.36 g and the lowest mean weight gained was 14.90 g corresponding to diets 5 and control (DT 1) respectively. Total feed fed was equally significant across the treatments following unique trend pattern of direct proportion to inclusion levels ($p<0.05$). This implies that the practical diets were palatable, easily ingested and efficiently utilized. This result follows [29], who reported that feed intake reduces with reduction in palatability. The specific growth rate, percentage weight gained and average daily weight gained observed in treatments showed that all practical diets were nutritionally adequate with increasing trend values as inclusion level increased. The best performed formulated diet was diet 5 with the lowest feed conversion ratio of 0.71g. The protein efficiency ratio was highest in diet 5 (90.18) and optimum fish yields of 21.50kg/m^3. Total protein intake, feed conversion ratio, protein efficiency ratio and total fish production were all significantly different across treatments /diets (p<0.05). This finding is in agreement with the result of [30] who reported significant different in growth performance and feed utilization of *Clarias gariepinus* fingerlings fed boiled Jatropha kernel meal based diets. The percentage survival was not significant (p<0.05) across the diets, the lowest value was observed in diet 2(93.33%) with total fish production (kg/m^3) of 9.05kg (Table 2). This result agrees with the report of [31] who reported that live organisms enhance the growth of fish at their early stage of development. The amount of feed ingredient depends on several factors, including nutrient requirements, ingredient cost, and its availability and processing characteristics.

Economic implication of different levels of substitution of SFWM for imported fish meal fish diets

The economic analysis shows reduction in the production cost of the experimental diets. An increase in inclusion levels of the smoked fish waste meal (SFMW) reduces production cost as substitutes (SFMW) for imported fish meal (IFM) that is more costly. The higher the inclusion of the substitute for IFM, the lower the production cost as evidenced in Table 5.

Table 5: Economic analysis of the experimental diets

Diets	Unit and total cost of Fish Feed Ingredients used per tonne									
	SFW	IFM	YM	Veg. Oil	Vitamins					Total
					Premix.	Lys.	Meth.	DCS	Salt	
₦/kg	150	600	50	200	780	850	2000	220	200	₦/1000g (1ton)
DT1	-	28,800	2300	600	780	425	1000	110	100	334,150.00
DT2	1800	21,600	2,300	600	780	425	1000	110	100	288,050.00
DT3	3600	14,400	2,300	600	780	425	1000	110	100	233,150.00
DT4	5400	7200	2300	600	780	425	1000	110	100	179,150.00
DT5	7200	-	2300	600	780	425	100	110	100	125,150.00



Weekly trend of growth responses of fish fed with different levels of smoked fish waste meal

Figure1 revealed different patterns of development of fish to varying levels of smoke fish waste (SFW) inclusion in their feed meals as indicated in their body weight gained per week. The trend of average weight gained obviously was higher for the fish fed with diet (d5) (this was feed with pure (100%) inclusion of smoke fish waste as substitute for imported fish meal). This implies that this diet was palatable, easily ingested leading to higher efficient feed conversion ratio resulting in repaid body weight gained.

Generally, the graph shows that the more the levels of SFW the better and faster the body weight gain of the fish. Moreover, SFW should be encouraged in the feed formulations among the fish growers for better fish weight gain and efficient feed management.

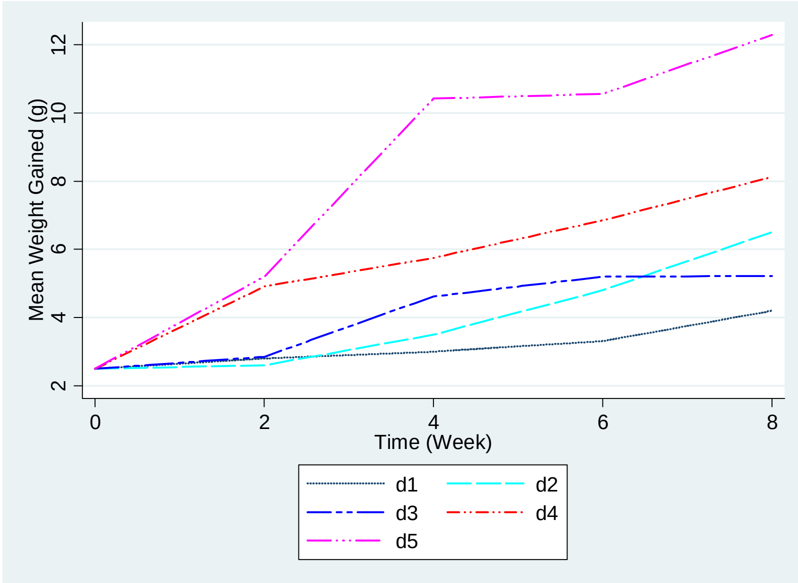


Fig 1: Growth Responses of Fish to SFWM Levels

Fish feed consumption and cost per weight gained (g)

The average quantity of feed consumed per weight gained and mean cost per weight gained of diets studied were displayed in figure 2 below. On average, the experiment showed that the quantity of feed consumed by fish per body weight in gram of diet(DT1) was more and the cost of diet (DT1) per weight gained was also higher whereas both feed consumed and cost per body weight gained were relatively small for diet (DT5). This experiment summarily showed that fish body weight increases and cost incurred per body weight declines as levels of inclusion of smoke fish waste is increasing in the experimental diets.

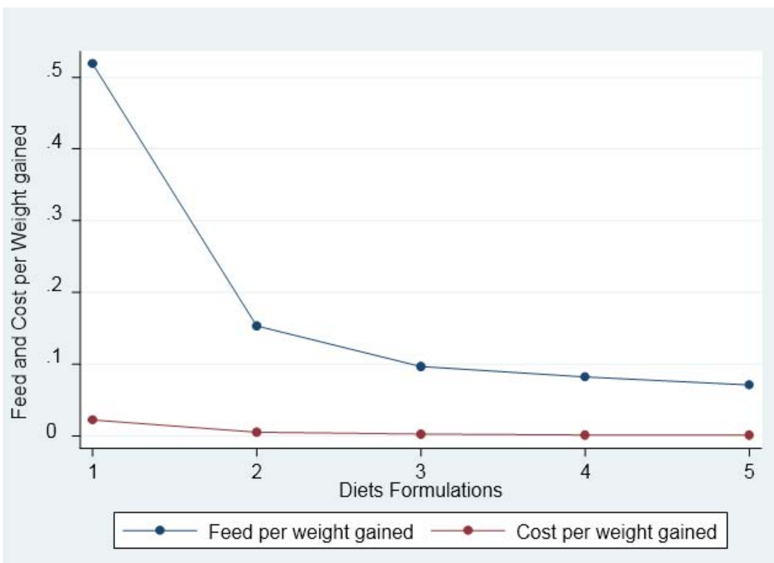


Fig 2: Feed consumed and cost per weight gained

Conclusion

This study clearly shows that the experimental diets were more acceptable, palatable, easily digestible and utilized. This may not be unconnected with rightful protein–energy ratio and value addition method of processing that necessary for adequate energy for maintenance and sparing action to achieve maximum growth and development in fish. The available proteins in the experimental diets were judiciously converted into flesh rather than source of energy that could have resulted to energy sapping and economic loss due to stunted growth. The replacement of imported fish meal (IFM) with smoked fish waste meal (SFWM) could be used for fish feed formulation. This is exhibited through several environment related factors and processing characteristics of SFWM. Smoked fish waste meal could be safely included in the diets fed to *Clarias gariepinus* juveniles with high total feed intake, low food conversion ratio, and high total fish production, less cost of feeding and possible higher profit.

Recommendations

The study using African catfish, Clarias gariepnus juveniles showed that SFWM could be used as a substantial source of protein concentrates since it was highly accepted even at highest inclusion level. Additionally, growth response and feed efficiency parameters as evidenced in their values suggested and confirmed the optimum utilization; complete replacement of imported fish meal is recommended with100% inclusion of SFWM.

References

1. Hardy Tacon AGJ. Semi Intensive Feeding Methods for Freshwater Fish: Concept and Research Approch In Feed Stuff 2002; 7(2):5-7
2. Kamal S, Pandian K. Training Manual on Breeding, Rearing and Management of Indian Major Carps, Air breathing Fiahes and freswater Prawns. https://www.researchgate.net/publication/260767090 accessed March, 2016.
3. Abdelghany AE. Partial and complete replacement of fish meal with gambusia meal in diets for red Tilapia, *Oreochromis niloticus* x *O. Mossambicus*. *Aquacul. nutrit.* 2003; 3:1-10.
4. Abdelghany AE, Ahmed MH, Sayed SH, Ibrahim HI, Abdu-fatah ME. Replacement of fish meal with poultry by-product meal in diets for Red mono-sex Nile tilapia, *Oreochromis niloticus.* Egypti. Jour. of Nati. And feed and agric. 2005; (1):1061-1063.
5. Ahmed MH. Evaluation of gambusia, Gambusia affinis, fish meal in practical diets for fry Nile tilapia, *Oreochromis niloticus*, *J. World aqua*. Sci. 2008; 39(3):243-250.
6. El-Sayed AFM. Protein nutrition of farmed tilapia: Searching for unconventional source. Proceeding of the 6th International Symposium on the Tilapia Aquaculture, Sept. Manilo, *Philippines* 2004; 1(14-16):364-378.
7. Falaye AE. Evaluation of the chemical and nutrient composition of Cocoa husk (*Theobroma cacao*) and its potential as a feed ingredients. *Nig. J. Basic Appl. Sci*. 1990; 4 (1/2):157-160.
8. Alegbeleye WO, Oresegun A. (1998) Nutritive values of three lumbrid worms for *Oreochromis niloticus*. In sustainable utilization of Aquatic/ wetland Resources. Selected papers from 9th/10th Annual Conference of the Nigeria Association for Aquatic Sciences. 1998, 165-176.
9. Fasakin EA, Balogun AM, Fagbenro OA. Evaluation of sundried water fern, *Azolla africana* and duckweed, *Spirodela polyrrhiza* in practical diets for Nile tilapia, *Oreochromis niloticus* fingerlings. Journal of appl. Aquaculture. 2001; 2(4):83-92.
10. Akinwande AA, Ugwumba AA, Ugwumba OA. Effects of replacement of fish meal with maggot meal in the dietof *Clarias gariepinus* (Burchell 1822) fingerlings. *The Zoologist*. 2002; 1:41-46
11. Fagbenro OA, Akande TT, Fapounda OO. Use of roselle (*Hibiscus sabdariffa*) seed meal as a Soyabea meal replacer in practical diets of fingerlings of African catfish (*Clarias gariepinus*). Proceedings of the 3rd International Conference of African Fish and Fisheries, Cotonou Benin, 2003; 10-14:73-79.
12. Omoyinmi GAK, Fagade SO, Adebisi AA. Nutritive value of invertebrates cultured under laboratory condtion. The *Zoologist,* 2005; 3:333-39
13. FAO. Use of algae and aquatic macrophytes as feeds in small-scale aquaculture (A review). FAO Technical, 2009, 531. ISBN 978-92-5-106420-7, Rome, Italy
14. Otubusin SO, Ogunleye FO, Agbebi OT. Feeding trials using local protein sources to replace fishmeal in pelleted feeds in catfish, *Clarias gariepinus* (Burchell 1822) culture. *Europ. Jour.l of scient. Resear.* 2009; 31(1):142-174
15. Fagbenro OA, Adparusi EO, Jimoh WA. Nutritional evaluation of Sunflower and Sesame seed meal in *Clarias gariepinus*: An assessment and nutrient utilization. Afr. J. Agric. Res. 2010; 5:3096-3101.
16. Sotolu AO. Effect of varying dietary protein levels on the growth performance of *Clarias gariepinus* fry. Jr. Livest. Res. Rural Dev. 2010; 22(4):312-318
17. El-Sayed AFM. Alternative dietary protein sources for farmed tilapia, *Oreochromis niloticus* spp. *Aquaculture*, 1999; 170:149-168.
18. APHA/AWWA/WPCF. Standard methods for the examination of water and wastewater. The 20th Edition. American Public Health Association American Water Works. Association and Water Pollution Control Federation; Washington DC. 1999; 460-472.
19. AOAC. Association of Official Analytical Chemists AOAC 16th edition Washington Inc, 2001.
20. NRC. Nutrient Requirement of Fish National Academy Press Washington DC, 1993, 114.
21. Brett JR. Energy expenditure of Sockeye salmon Oncorhynchus nerka, during sustained Performance. *J. Fish. Res*.; Board Can. 1973; 30:1799-1809.
22. Jauncey K, Ross B. A guide Tilapia feed and feeding. Institute of Aquaculture University of Stirling FK9 4 CA, Scotland, 1982.
23. Ajani EK, Akinwole OA. Recommended water quality for warm water Fishes in Fish farming. University of Ibadan, Agric. *Res*. 2001; 3:19-23.
24. Lovell T. Nutrition and Feeding of Fish Van Nostrand Reinhold 1989; New York, USA. ISBN - 13:9780442259273, 260.
25. NRC. Nutrient Requirement of Fish National Academy Press Washington, DC, 1993; 114.
26. Falaye AE. Utilization of Agro-industrial wastes as fish feed stuff in Nigeria proceedings of the 10th annual Conference of the Fisheries Society of Nigeria, Nov. Abeokuta, Nigria, 1992; 16-20:262-262.
27. Guerrero RD. The culture and use of Perionyx excavates as a protein resource in the Philippines Dawin entenary Symp. On earth worm Ecolgy, Inst. Of Terrestial Ecology, U. K. August, 1981, 4.
28. El-Sayed SA, El-Kholy M, El-Eleraky WA, Soliman M H. Effect of partial replacement of yellow corn with dried citrus pulp in Nile tilapia diets on growth performance, nutrient digestibility and immune status. Retrieved on 22 August, 2013.
29. Pheng Buntal AL. FAO. Utilization of Cocoa Hurst in the Nutrition of Tilapia (*Oreochromis niloticus*) Ph.D Thesis; University of Ibadan Nigeria, 2008.
30. Alatise SP, Adedokun MA, Adelodun OB, Ajiboye GE. Effects of Boiled Jatropha Kernal Meal as a Subtitude for Soyabeans Meal in Diets of African Mud Catfish (Clarias gariepinus) Fingerlings. *Jour. of Fish. And Aqua. Sci.*; ISSN / DOI, 2014; 10(3923):1816-4927.
31. Ugwumba AAA, Abumoye O. Growth response of *Clarias gariepinus* fed live maggots from poultry droppings. In sustainable utilization of Aquatic/Wetland Resources Selected papers from 9th/10th Annual Conference. 1998, 182-188.