E-ISSN: 2347-5129
P-ISSN: 2394-0506
(ICV-Poland) Impact Value: 5.62
(GIF) Impact Factor: 0.549
IJFAS 2021; 9(3): 260-264

www.fisheriesjournal.com
Received: 07-03-2021
Accepted: 09-04-2021

Fakunmoju FA
Dept of Fisheries Technology,
Lagos State Polytechnic,
Ikorodu, Lagos State, Nigeria

Babalola AO
Dept of Fisheries Technology,
Lagos State Polytechnic,
Ikorodu, Lagos State, Nigeria

Emrys ME
Dept of Fisheries Technology,
Lagos State Polytechnic,
Ikorodu, Lagos State, Nigeria

Corresponding Author:
Fakunmoju FA
Dept of Fisheries Technology,
Lagos State Polytechnic,
Ikorodu, Lagos State, Nigeria

Cholesterol level and proximate composition of African catfish (*Clarias gariepinus*) fed six commercial floating fish feeds

Fakunmoju FA, Babalola AO and Emrys ME

Abstract
270pcs of Juvenile *Clarias gariepinus* with average weight of 9.33±0.348 were purchased from fish farm estate in Ikorodu and were weighed into 6 treatment tanks replicated thrice and fed with 6 different commercial floating feeds (alleraqua, sarb, top feeds, prime, ecofloat and blue crown) for 70 days. The result shows that fish fed with blue crown feed had the highest weight gain followed by the fish fed with sarb, eco float, alleraqua, top feed and least in prime (83.90±0.65, 81.66±0.70 80.85±0.62, 80.55±0.54, 79.63±0.51 and 63.67±0.80gms) respectively. Statistical analysis revealed that there is significant differences (p<0.05) in mean weight gain of the fishes. The specific growth rate reflects that majority of the fish fed with the treatment feed had the same SGR as follows 1.35, 1.34, 1.35, 1.05, 1.30, and 1.35 respectively and which were significantly different (p<0.05). The carcass composition is a reflection of the quality of the feed fed to the fishes. The cholesterol level of the fish revealed a higher level of 425L as compared to the rest at 170, 193, 150, 139, and 173 respectively which were contrary to the recommended level of 200L recommended by (World Health Organisation).

Keywords: *Clarias gariepinus*, feeds, growth, proximate composition, cholesterol

Introduction
Aquaculture refers to the breeding, raising, and harvesting of aquatic animals and plants in various managed water environments. Its mission is to produce food and commercial goods, as well as to preserve and enhance ecosystems and repopulate endangered species populations. Aquaculture can be classified into two categories: aquatic and freshwater. It is a vital economic field for the nation.

At a time when the government is looking for ways to diversify the economy away from its reliance on oil, this is a welcome move. It is a potential means of contributing to the nation's food security, both directly by producing fish for human consumption and indirectly by creating jobs for the country's growing unemployed population, as well as generating foreign exchange through the export of fish and fish products. Aquaculture is one of the world's fastest-growing food-producing industries. According to [2], global aquaculture production has quadrupled in the last twenty years, with aquaculture production likely to double in the next fifteen years as wild fisheries hit their biological limits and global demand for classy fish continues to increase. Annual fish demand in Nigeria was 2.66 million metric tonnes in 2012, while supply was just 1.32 million metric tonnes. Local production accounts for 0.62 million metric tonnes, while imports account for 0.7 million metric tonnes. Aquaculture accounts for just 200,000 metric tonnes of the global fish supply. The current aquaculture production falls well short of its capacity of 2.5- 4.0 million metric tonnes Nigeria is a coastal country with the Atlantic Ocean on its southern border. It covers 923,766 square kilometers and has about 1.75 million hectares of suitable land for aquaculture production. The aquaculture sub-sector is considering a more viable option for meeting the country's need for fish production self-sufficiency. This underpins its high investment and return on investment reliability compared to catch fisheries, capital intensity is low. Nigeria's federal government has been aggressively promoting the growth of the agriculture sector in recent years in order to meet growing demand for fish and fish products, as well as diversify the country's oil-based economy. The aim of the federal government is to achieve self-sufficiency in fish production and, finally, to have fish products available for sale. Unfortunately, despite being a source of livelihood for

many coastal populations, the fisheries sub-sector is underdeveloped.

Rapid population growth in developing countries like Nigeria, increasing disposable income, and evolving consumer tastes have all led to a substantial increase in the annual demand for aquatic food sources. Fish supplies have been reduced on a large scale due to the introduction of more efficient capture technologies, decades of state subsidies, expanded market access even for remote fishing communities, and development initiatives aimed at increasing production from the delicate open-access resource. As a result, there is increasing concern about the long-term viability of wild fish stocks. The need for long-term investments is to ensure the long-term viability of aquaculture production cannot be overstated. Design, ecosystem-based resource management, the post-harvest market, and human resource growth are all common areas of intervention in this seemingly important yet underserved sector. This explores the values, status, patterns, and future requirements for investments in aquaculture and fisheries

Fisheries and aquaculture are important parts of the global food supply, and demand for high-quality aquatic protein is expected to rise significantly as income levels rise and Asia and Africa's populations grow [4]. Many Nigerians eat a lot of fish, and it's a vital part of their diet with a wide variety of amino acids, vitamins, and minerals, this diet has a lot of nutritional value. Furthermore, fish products are less expensive than beef, pork, and other animal protein sources in the country [6]. As a result, fish is in high demand. Fish accounts for about 41% of the meat consumed in the typical Nigerian diet, but domestic supply is inadequate, forcing the country to spend $500 million on imported fish per year [13].

Aquaculture production in Nigeria is currently being motivated by social and economic objectives such as improving rural nutrition, generating supplemental income, diversifying income activities, and creating jobs.

Justification

The research is envisaged to give knowledge on various type of fish feed that has been used on *Clarias gariepinus* since the inception of floating fish feed into Nigeria and the side effects of their use on the nutritional composition of *Clarias gariepinus* and their relative effect on the (cholesterol) level.

Materials And Method

Study Area

The experiment was carried out between November 2018 to February 2019 at the fisheries and Hatchery Unit of the department of fisheries technology, Lagos state polytechnic, Lagos3.0 Nigeria

Experimental Fish

A total of 270 juveniles of the African catfish (*Clarias gariepinus*) were purchased from a fish farmer at Odogunyan fish farm estate and were transported to the experimental unit using a well aerated plastic water container to Lagos state polytechnic.

Experimental Design

An empty rectangular plastic of the same sizes was used with the measurement of 46.5cm length, 30.9cm width and 23.8cm depth each and 2*2 wooden rod was used in demarcating the plastics in between each other so as to hold plastic tight and ¼ inch pipe was used to run water from the main tank into each unit with an outlets fix inside the plastic to remove excess water more also to drain water from the plastic when changing the water.

The fish was acclimatized to the hatchery condition for two weeks prior to the experiment, They were later randomly stocked into a total of eighteen [18] units of six [6] treatment for twelve weeks feeding trial at 15 fish per plastic of varied size per units making it total of 270 juveniles of African cat fish*(Clarias gariepinus*).

Feeding Of The Fish

The fish was fed by 8:am in the morning and 4:pm in the evening with six [6] Commercial Feed which are Sarb, Alleraqua, Prime, eco float, Top feed, and blue crown and are fed at 5% body weight. The Fish weights were measured individually (i.e. unit by unit) once a week and the quantity of feed was adjusted based on the changes in body weight of fish of subsequent feeding using a Citizen 5000 MP weighing balance. Fecal materials and leftover feed were siphoned.

Growth Indices Monitored During The Study

Diet performance would be evaluated as follows using formulae adapted from Peterson and small (2007)

Weight Gain (ΔW) = Final Weight (Wf)-Initial Weight (Wi)

Mean Weight gain (MWG) = Wf-Wi/N!

Specific Growth Rate (Sgr)

Specific growth rate is the logarithmic exponent of weight gained by the fish per unit time expressed in percentage.

The formula is:

SGR=Log e{(Wf-Wi)/t2-t1(day)}*100

Feed Conversion Ratio (Fcr)

FCR is the ratio of dry weight of food eaten to the weight gained, and is given as:

Dry weight of food eaten (g)/fish weight gain (ΔW)

Where:

Wf = final weight of the fish

Wi = initial weight of the fish

N = number of the fish used

ΔW = change in weight

T2=Final time

T1=initial time

Protein Efficiency Ratio

Protein efficiency ratio is the ratio of weight gained by the fish to crude protein consumed measured in grams.

It is stated as: PER={ΔW/C.P}g

Mortality Ratio

M=(N°-Nt*100%N°)Where N° is the number at the start of the experiment and Nt represent end of the experiment.

Feed Purchased

The fish feed was purchased at the fish feed store (sabo market, Ikorodu, Lagos state) during the experimental period

Water Quality Parameter Monitored During The Experimental Period

The water quality parameters of dissolved oxygen, temperature, and pH were monitored on alternate days. Early in the morning (6.00-7.00am) on the days when the water quality parameters were taken, the oxygen meter (Jenway model 9071, QA, UK) was used to take the dissolved oxygen and temperature, while the pH was also taken using a

digital/electronic pH meter (Mettler Toledo 320 model, serial No. M 5970, UK).

Collection Of Blood For Analysis

The fish, from which blood for hematology was collected, were anaesthetized with 150 mg/l solution of tricaine methane sulphonate . Blood samples were taken with 2ml heparinized syringes and 21swg needles from the caudal vein of a set of three *clarias geriepinus* juveniles from each treatment, the blood was kept in an airtight EDTA container in the hatchery unit, the required amount of the sample was taken to the laboratory of the college of medicine, university of Lagos for subsequent chemical analysis which was done within three days according to the analyst

Statistical Analysis

Data were analyzed using special package. Analysis of variance was used for significant differences among treatment mean. Data obtained were subjected to two-way analysis of variance (ANOVA) and Duncan's Multiple Range Test was use to compare the mean difference, at 5% significance level.

The fish blood was analyzed according to standard procedure given in association of official analytical chemist (AOAC1980) the triplicate sample of each fish blood was used to determine the hematological effect (cholesterol level).

Result

The growth performance values in terms of weight gain (g), specific growth rate, feed conversion ratio, protein efficiency, and mortality rate (%) of *Clarias gariepinus* juveniles in the different treatments are presented in (Table 1).

The proximate analysis shows that there is a significant difference between diets as shown in table 4. Water quality parameters in the experimental tanks showed no variation throughout the duration experimental trial as reflected in (table 5).

The performance in terms of mortality rate on different diets is shown in (table 1) which was very low as revealed in Treatment 1, 2, and 6 with varying levels of between (1% and 3%).

The growth response in all the treatments is presented in Table 4. The percentage weight gain recorded in catfish fed with diet 1,2,3,5 & 6 except diet 4 were all significantly different. The performance of cat fish fed diet 1, 2, 3, 5 & 6 performed better than fish fed with diet 4.

The same trend was observed for specific growth in rate (SGR) and feed conversion ratio (FCR). There were significant difference in these indices (p<0.05) and protein efficiency ratio (PER) that showed no significant difference between treatments (p<0.05).

The crude protein of the experimental fish in all the treatments had a significantly moderate protein value than the initial fish. A Significant difference exist in crude lipids values obtained in the initial fish and that obtained in fish fed with the experimental diets, 1,2,3,5 & 6, but no significant difference existed between the initial value and that of fish fed with diet 4.

Carcass composition of the fish at the end of the feeding trial was significantly different from the initial composition in crude protein and crude lipid contents as revealed in (Table 2)

No significant difference exist in the haemotological parameter (cholesterol) conducted on the experimental fish as shown in table 3 except with treatment 4 having the highest value.

The cholesterol level of all the fishes in all the treatment across all the commercial feeds are not significantly different at p<0.05% level of probability

The cholesterol table shows that the various parameter values are within the acceptable range for fish culture

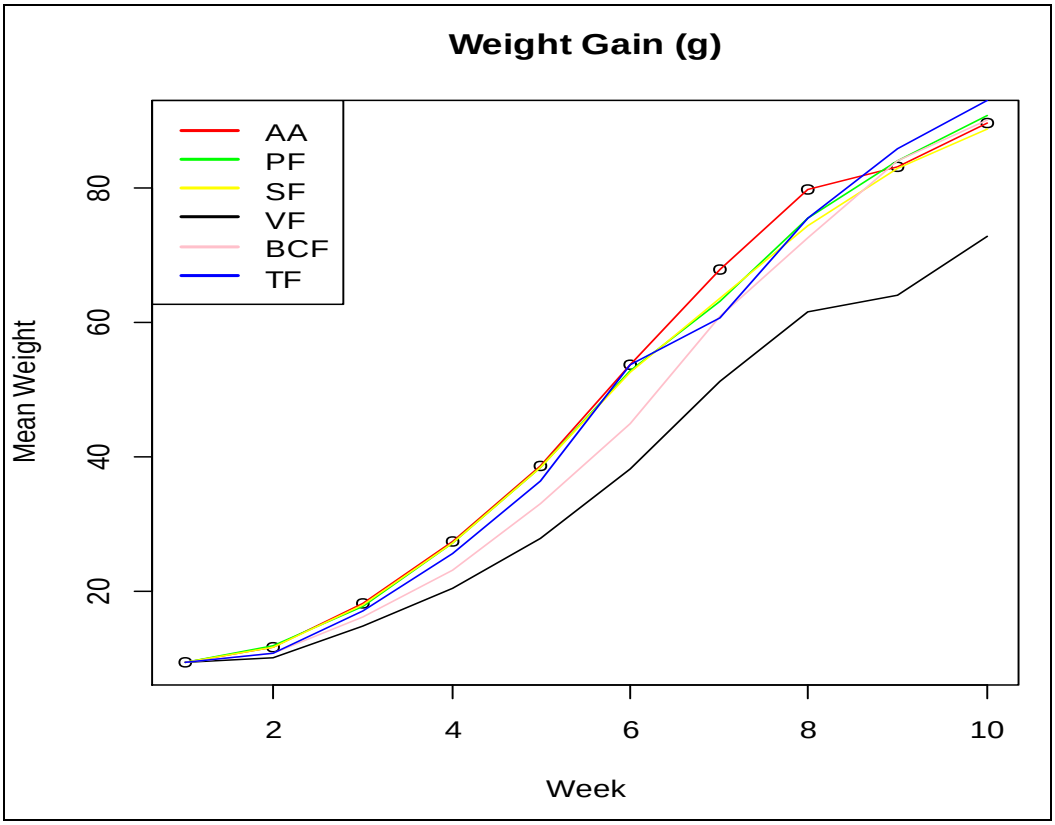

Fig 1: shows the line curve of *Clarias garipenius* juvenile growth using different types of Commercial feed AA= ALLER AQUA, PF= PRIME FEED, SF=SARB FEED,EC =ECO FLOAT, BCF=BLUE CREST FEED, TF= TOP FEED

Table 1: Growth and feed utilization parameters of *Clarias gariepinus* fed at 5% body weight

Data	Treatments					
	T_1	T_2	T_3	T_4	T_5	T_6
Initial weight (g)	9.33±0.348	9.33±0.348	9.33±0.348	9.33±0.348	9.33±0.348	9.33±0.348
Final weight(g)	89.88±7.84^{ab}	90.99±15.01^{b}	88.96±6.85	72.9±5.78	90.17±15.02	93.23±17.05
Weight gain	80.55±13.35^{b}	81.66±4.55	79.63±1.97	63.67±0.29	80.84±2.71	83.90±5.46
Specific growth rate	1.35±0.09	1.34±0.08^{b}	1.35±0.09	1.05±0.10	1.30±0.12	1.35±0.14
Feed intake (g)	1083.9±12.05	1059.6±11.09	1050±10.05	833.2±9.02	1003.2±11.05	1052.4±10.06
Feed conversion ratio	13.46±0.58	12.97±0.51	13.19±0.61	13.08±1.08	12.41±0.82	12.52±0.07
Protein efficiency	1.97±0.06^{b}	2.02±0.09^{b}	1.97±0.05^{b}	1.97±0.03^{b}	2.00±0.07	2.07±0.10
Mortality rate (%)	1	3	5	8	5	3

*Means with same superscript are not significantly different
FCR (Feed Conversion Ratio) = TF/(Wf-Wi). TF is the average total feed fed to a fish
PER (Protein Efficiency Ratio) = Wet weight gain (g)/protein fed (g)
SGR (Specific Growth Rate) = 100 x (In Wf-in Wi)/rearing period (days), where Wfis Final weight and Wi is initial weight

Table 2: Carcass Composition of *Clarias gariepinus* (on a dry matter basis) fed with 6 different floating feed samples for 70 days. Mean ± S.E of three replicates

Treatment	Moisture	Crude protein	Crude lipid (fat)	Ash	Fibre	Calcium	Energy
Diet 1	8.5±0.74^{a}	44.0±1.19^{a}	12.0±1.40^{b}	5.0±0.44^{b}	2.01±0.04^{a}	0.8±0.01^{a}	19.5±1.85^{a}
Diet 2	7.6±1.78^{b}	43.0±0.81^{b}	11.8±0.27^{a}	7.0±0.29^{a}	2.0±0.04^{b}	1.8±0.04^{b}	16.5±1.80^{b}
Diet 3	6.2±1.49^{c}	38.0±0.5^{b}	14.2±0.22^{a}	6.0±0.44^{a}	1.2±0.01^{c}	2.0±0.05^{c}	18.5±1.82^{c}
Diet 4	7.5±0.92^{bc}	35.0±0.70^{b}	6.4±0.28^{b}	6.8±0.11^{a}	3.0±0.06^{ab}	1.8±0.04^{b}	18.0±1.82^{ab}
Diet 5	8.3±0.33^{a}	44.0±1.19^{a}	10.2±0.60^{a}	7.2±0.26^{ab}	2.5±0.05^{bc}	1.6±0.03^{bc}	17.0±1.80^{bc}
Diet 6	9.01±1.50^{bc}	42.0±0.32	10.8±1.20^{b}	5.0±0.44^{b}	3.0±0.16^{ab}	1.8±0.04^{b}	16.6±1.99^{c}

*means with Diet 1 (Alleraqua) Diet 2 (Prime) Diet 3 (SARB) Diet 4 (Vita feed) Diet 5 (Blue Crown) Diet 6 (Top feed)

Table 3: Haematology of *Clarias gariepinus* fed with 6 different diet of floating feed for 70 days. Cholesterol Level

Replicates	T_1	T_2	T_3	T_4	T_5	T_6
1	171±5.01	197±6.05	150±2.51	189±5.01	426±15.02	174±5.03
2	170±5.00	192±6.03	150±2.51	188±5.00	425±15.01	173±5.02
3	171±5.01	193±6.04	150±2.51	190±6.01	426±15.02	173±5.02
Total	512	579	450	567	127	52
Mean value	170	193	150	189	425	173

.

Table 4: Proximate composition of the diets fed to *Clarias gariepinus* for 70 days as revealed by the label

Treatments	Crude protein	Crude fat	NFE	Fibre	Ash	Phosphorus	Calcium	Sodium	Mg
Alleraqua	45	12	26.4	20	6	1	0.2	0.8	
Prime	45	12	-	2.0	7	1.1	1.7	-	50
SARB	40	15	-	1.4		0.83	1.0	-	
Eco float	38	6	-	2.5	17	0.9	1.5	0.2	
Blue Crown	45	8.0	-	2.0	8.0	1.16	1.5	0.30	
Top Feed	45	7.0	-	3.0	7.0	1.1	1.5	-	

Water Quality Parameters

Results of water quality parameters monitored during the course of the experiment/study are shown in table 5 below

Table 5: Water Quality Parameter monitored during the Experimental Period

Parameter Measured	Minimum Range	Minimum Range
Temperature	24^{0}C	26^{0}C
Ph	6.97	7.04
Dissolved Oxygen	6.96mg/L	8.31mg/L
Free Carbon(IV)Oxide	0.00ppm	4.05ppm
Total Alkalinity	0.00ppm	0.00ppm

Discussion

The growth performance indices in terms of weight gain (g), specific growth rate (SGR) and survival value (%) of *C. gariepinus* juveniles in different treatments are shown in table 1.

The ANOVA results indicated significant difference in weight gain & SGR among treatment means ($p>0.05$).

Mortality rate was very low during the experiment. Survival for all the treatments were placed as follows T1 (99%), T2 (97%), T3 (95%), T4 (92%), T5 (95%) and (97%) in T6 respectively and which are not affected by the diets. The result indicates that all the diets promoted growth in *Clarias gariepinus* Juveniles, but fish grew significantly larger on those feed containing highest protein and lipids levels (45%, 12% respectively). These growth rates compare well with the results of comparative feed trials conducted within the riverine catfish Ritarita by [1] recorded significantly higher growth rates in Juveniles fed chicken viscera in (47.58% CP) as compared to local prawn (45.7% CP) and formulated feed (43.5% CP). The results also compare well with comparative feed trials of [14] and [11] who recorded best growth performance for feed containing 40% and 58% of CP respectively in Clarias spp.

The results is in agreement with that of [9] who reported an increase in weight gain and SGR in post larvae in Clarias hybrid fed increased Level of protein during the study conducted using 250, 300, 350, 400g (CP) kg-1 dry matter.

With reference to the different manufactures label, the constituent macronutrients for all the commercial feed used in

this study varied, though that of alleraqua, prime, SARB, blue crown and top feed were almost identical. These differences most likely accounted for the observed differences in growth rate.

The observed performance in terms of weight gain with fish fed with diet 1, 2, 3, 5 & 6 respectively might be a reflection of the requirement of African catfish that need a balance of the n-3 PUFA found in fish oil. This results agrees with the result obtained by (12) that up to 8% of refined, bleached, deodorized, palm oleic (RBDPO) or Crude palm oil (CPO) can be included in diets for the African catfish with improved performance, protein retention and fillet vitamin E concentration of this fish.

The protein content of the carcass composition was not significantly different between treatments, although there was a significant difference between the values of fish fed different treatments of the initial fish which had a lower value. The lipid content of the initial fish was not significantly different from that of all treatment fish fed. The ash content did not present any significant difference between treatment groups (Table 2). The result of the analysis on heamatological parameters of *Clarias gariepinus* in this study showed significant difference between the treatment values of 4.35L of cholesterol level. These significantly shows that the range value of 4.25L is higher than the recommended value acceptable in human diet, which is 2.00 mg/DL reported by [8].

Conclusion And Recommendation

Based on the facts and findings of this research it can be concluded that feeds (1, 2, 3, 5) SARB, Topfeed, prime and blue crown could be adopted by the farmers in the feeding of their fishes due to the fact that their cholesterol level reflected on the fishes fed is within the required standard (2002) recommended by World Health Organization as regarded by [8] for human consumption.

Reference

1. Amin MR, Mollah MFA, Ali MR, Nahiduzzam AN. Effects of different food items in the growth and survival of endangered riverine catfish ritarita (Hamilton) University Journal of Zoology. Rajshahi University and *Ictaluru spunctatus*". J. of the World Aquaculture 2010.
2. Ayinla OA. Aquaculture development and appropriate enterprise combination in the braced states. In the high level meeting of experts and the meeting of braced states agriculture. Songhai farms, Port -Harcourt 2012, 1-6. Aquaculture res
3. Ayinla OA. Nutritive and reproductive performance of *Clarias gariepinus* (burchell 1822). Unpublished phd thesis, University of Ibadan, Nigeria 1988, 433.
4. Delgado C, Wada N, Rosegrant M, Meijer S, Ahmed M. Fish production by 2020. supply and demand in changing global markets. Washington, D.C, and Penang: Ifpri (International Food Policy Research Institute) and World Fish Center 2003.
5. Eyo VO, Ekanem A. Effect of feeding frequency on the growth, food utilization and survival of African catfish (*Clarias gariepinus*) Using locally formulated diet. African Journal of Environment Pollution and Health. 2011.
6. FDF, Fisheries statistics of Nigeria projected human population; Fish demand and supply in Nigeria, a publication of federal department of fisheries 2000 – 2015. 2008.
7. FDF. Fisheries statistics of Nigeria. 4th Edition.1995-Fingerlings fed on dried fish and chicken viscera incorporated diets 2007, 49.
8. Fletcher J. "What Should my Cholesterol Level be at my Age?." Medical News Today 2017. https://www.medicalnewstoday.com/articles/315900.php. Food Standards Agency, UK archived 2010-10-07 at the Wayback Machine.
9. Giri SS, Sahoo SK, Sahu AK, Meher PK. Effect of dietary protein level on growth, survival, feed utilization and body composition of hybrid clarias catfish (*Clarias betrachus* x *Clarias gariepinus*). Animal Feed Science and Technology 2003
10. Giri SS, Shoo SK, Sahu AK, Mukhopadhyay PK. Growth, feed global agriculture information network (gain) (2007). Nigeria fishery products, Nigeria's fish market gain report number 17026. Lagos, Nigeria 2001.
11. Henken AM, Machiels MAM, Deeker W, Hogendoorn H. The effects of dietary protein and energy content on growth rate and feed utilization of the African catfish, *Clarias gariepinus* (burchell 1822). Aquaculture 1986.
12. Lim PK, Boey PL, Ng WK. Dietary palm oil level affects growth performance, protein retention and tissue vitamin concentration of African catfish, *Clarias gariepinus.* Aquaculture 2001.
13. Oyinbo O, Lekwot GZ. Fishery production and economic growth in Nigeria: Pathway for Sustainable Economic Development. J of Sustainable Dev. in Africa 2013.
14. Rahman MA, Badhra A, Begum N, Hossain MG. Effects of some selective supplemental feeds on the survival and growth of catfish (*Clarias batrachuslin).*fry. Bangladesh Journal of Fish Research 1997.