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UTILISATION OF MELLON SHELL AS DIETARY ENERGY SOURCE IN THE DIET OF NILE TILATIA (*Oreochromis Niloticus*)

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Abstract:*The study investigated the growth performance of tilapia; Oreochromis niloticus (L) fingerlings (1.6±0.02g) fed isonitrogenous diets of 30% crude protein. Mellon shell meal (MSM) was used to replace maize at inclusion levels of 0%, 25%, 50%, 75% and 100% designated as diets 1 to 5 respectively. Replicate of the treatments were randomly arranged in an outdoor aquaria facility. The feeding trial lasted for 56 days. The results obtained showed significant differences (P<0.05) for growth parameters measured. Fish fed diet containing 75% MSM gave the highest mean weight gain (MWG) of 1.88 g; highest specific growth rate (SGR) of 1.21; best food conversion ratio (FCR) of 0.56 and Protein efficiency ratio (PER) of 0.62. Fish fed diet containing 0% MSM gave the poorest MWG of 0.87g and the poorest SGR, FCR and PER values. There were no significant differences in MWG of Fish Fed Diets 1, 2, 3, and 5 (P>0.05). It can be concluded that Mellon shell meal inclusion in the diet of Tilapia up to 75% can be effectively utilized by the Oreochromis niloticus.*

Keywords: *Mellon shell, Oreochromis niloticus, energy.*

I Introduction

Success in aquaculture depends on the ability of the farmer to cost effectively meet the nutritional demands of the cultured fish species, feeding nutritionally complete or balanced manufactured feeds to fish is very important. This is because feed type as well as feed quality may have consequences on both growth efficiency and feed utilization (Tsevis *et al.,* 2000). This stresses the importance of having proper education or orientation on fish nutrition. The knowledge of fish nutrition equips the farmer with the technical knowhow of making nutritionally balanced feed from available raw materials (Louis, 2002). In view of producing nutritionally balanced commercial diets that will permit optimal growth of fish growth and health, research into fish nutrition has increased dramatically in recent years (Houlihan*et.al.* 2001, Steven and Louis, 2002)Aquaculture is aimed at the attainment of sustainable fish production at the minimum possible costs in the shortest possible time (Eruvbetine *et al,* 2002). This has proved difficult in the developing nations because of the dependency on imported feeds which are very expensive, while local feeds made from some conventional feedstuffs are also expensive because of the demand for the conventional feed ingredients by other sector and human consumption especially maize crop (Ogunlande, 2007). Similarly, in the face of teaming population of the developing nations, the conventional protein and energy ingredients used in feed production for aquaculture and livestock represent products that are needed also in human nutrition and are presently inadequate hence aquaculture and animal production competes directly with man for the consumption of agricultural produce (Ardon *et al,*1998).

This gives rise to expensive feeds which will eventually marginalized and possibly nullify the profitability of fish farming thereby incapacitating the expansion of farms to increase production and consequently low yield in terms of fish quality and quantity, resulting in the scarcity of the commodity (fish) and eventually high cost of the few available ones to the disadvantage of the populace (Ogunlande, 2007, Adikwu, 1992).The fact that Fish feed account for at least 50-60% of the total cost of production (Gabriel *et al,*, 2007, Falaye, 1992), has motivated the research for cheap and locally available or improvised feed ingredients that are unsuitable for direct human consumption but can serve as alternative energy feed for fish with the aim of reducing the cost of production without compromising feed quality. Agricultural wastes such as husk, shells, backs, residues etc. are wastes produced at agricultural premises as a result of agricultural value addition. Such wastes can be effectively utilised as feed ingredients for fish and animal feeds.Most unconventional feed ingredients are either crop residues or agro-industrial by-products. Crop residues are high in fibre, low in nitrogen and of low digestibility. They include cereal and legume straws and stalks. Agro-industrial by-products result from processing of crops such cereals (e.g. milling, alcohol fermentation), oilseeds, sugar beet, and citrus fruits. Agricultural by-products and unconventional feed stuffs can be used as alternative to the very expensive conventional feed stuffs in fish feed (Falaye, 1992).

II Materials And Methods

Nile tilapia (*Oreochromis niloticus*) fingerlings with an average weight 1.60 ± 0.05g were transported from National Institute of Fresh Water and Fisheries Research (NIFFR) New-Busa Niger state to the departmental farm of Water Resources, Aquaculture and Fisheries Technology of the Federal University of Technology, Minna. On arrival, fishes were acclimatized in a plastic bowls for two weeks and were fed on commercial diet. Fish were thereafter, randomly stocked in replicate, in 25 litres round plastic bowls at a stocking rate of 15 fish per bowl. The bowls were arranged in a randomized block and were covered with Mosquito nets to prevent fish from jumping out the bowls. The fishes were fed thrice trice daily between the hours of 10:00, 16.00 and 18.00 hrs respectively on the test diets at 3% body weight per day. The feed intake was calculated and readjusted fortnightly according to change in the body weight. Water exchange was done simultaneously with the siphoning of faces and uneaten feed daily. The Siphoned faecal matter was oven dried and kept in the refrigerator for further analysis, while the uneaten feeds were used to evaluate percentage feed intake at the end of the experiment. The water quality parameters were monitored on a weekly bases for temperature using clinical thermometer; dissolved oxygen according to the method of Wrinker's (Lind, 1979 APHA, 1980); Hydrogen iron concentration (pH) was measured using a EIL 7045/46 pH meter in the laboratory at room temperature while conductivity was monitored using conductivity meter.Five experimental diets were prepared as diet 1 to 5, having varying level of mellon shell meal (MSM) (Table 2). Diet 1 had 100% Maize 0% Melon shell meal, diet 2 contained 75% Maize meal (MM) and 25% Mellon shell meal, diet 3 comprises 50% each for both Maize meal (MM) and Mellon shell meal (MSM), Diet 4 (D4) had 25% Maize meal (MM) and 75% Mellon shell (MS), while diet 5 had 0% Maize meal (MM) and 100% Mellon shell meal (MSM).
The Pearson square method of feed formulation was used for the formulation of the five diets, having a target crude protein level of 30% for each of the diets. The feedstuff were milled separately using the common tomato milling machine, after weighing them into correct proportion for each diet they were hand mixed thoroughly in a bowl, 10% w/v water was added to form consistent dough for each diet. The dough formed for each of the diet was pelleted using the hand pelleting machine and then oven-dried at 60 ^{o}C for 24 hours.

III Chemical Analysis

7 fishes were randomly selected and sacrificed for determination of initial whole carcass composition. The fishes were bulk weighed bi-weekly and at the end of the experiment, all fishes were weighed, and individually counted. 6 fishes from each treatment were collected for determination of final whole carcass composition.General chemical analyses were carried out on feedstuffs, diets and carcass for their proximate analysis for moisture, protein, lipid, ash and crude fibre, using standard procedures (AOAC, 2000).

Moisture

This is gravimetric measurement of moisture in the feedstuffs, diets, and carcass – expressed as a percentage of the initial sample weight. A representative sample was dried to a constant weight in an oven at 110°C. Moisture (%) was expressed as = (W1 – W2) / W1 X100

Crude Protein (CP)

This determined by the Kjeldahl method by taken 0.5g-1.0g of the sample which was digested with 20ml of concentrated sulphuric acid and a Selenium digestion tablet. Heated on a heating mantle until the solution became clear. The ammonia in the digest were released when reacted with 10ml of 40% Sodium hydroxide during distillation which was trapped in 2% boric acid mixed with methyl red indicator. 50-75ml of distillate was collected and titrated against standard 0.1ml hydrochloric acid. A digest treated the same way was used as the blank titre. Percentage crude protein value was calculated using the titre value for the blank and test samples as follows:

$$\% \text{ crude protein} = \frac{\text{Sample titre} - \text{blank titre} \times 0.1_1 \times 0.014_2 \times 6.25_3 \times 100}{\text{Weight of sample (g)}}$$

Where,
1. Normality of hydrochloric acid
2. Molecular weight of nitrogen
3. Nitrogen factor; since protein is assumed to be 16% nitrogen

Crude Lipid

The method employed was that of solvent extraction using a Soxhlet extractor. Crude lipid in diets was determined by extraction with petroleum ether in feedstuffs and fish carcasses. The extract is collected in a cup and, when the process is completed, the solvent is evaporated and the remaining crude lipid is dried and weighed. crude lipid was calculated using following formula:
Crude lipid (%) = (extracted lipid/ sample weight) X 100

Crude Fibre (CF)

This method depends upon digestion of moisture free and solvent extracted sample with weak acid solution and then with weak base solution. The remaining residue is ashed and the difference in weight on ashing is considered crude fibre (hydrolysis resistant organic matter). It is expressed as;
Fibre (%) = [(digested sample W1 – ashed sample W2) / sample weight] X100

Ash

Ash content was determined as total inorganic matter by incineration of the sample at 600° C.
Ash content was calculated according to the following formula; Ash (%) = (ash weight / sample weight) X □ 100

Nitrogen Free Extract (NFE)

Nitrogen free extract (carbohydrate) was calculated by subtracting the total percentages of moisture, crude protein, crude lipid, ash and crude fibre from 100%.
NFE (%) = 100 – (moisture* + protein + lipid + ash + fibre**)
* In case of dry matter basis, moisture was excluded
** Fibre is included here so that NFE represents potentially available carbohydrate

Acid insoluble Ash (AIA)

For the digestibility analysis, Acid insoluble ash of the diets and feacal samples were determined according to Cockrell *et al*., (1987). Fish within each group were pooled for carcass analysis. All samples were analyzed in triplicate. The diet and the feacal samples were ashed at 600°C for 6 hours. After which they were boilded with 250 ml 10% hydrochloric acid (HCl) for 5-10 minutes. The solution was filtered through ashless filter paper and thoroughly washed with hot water. The filter paper including the residue on the filter paper were then put into a dry crucible and placed in a muffle furnace at 600 °C for 2 hours. The resulting acid insoluble ash were cooled and weighed.

$$\% \text{ Acid insoluble Ash} = \frac{\text{wt. of Acid Insoluble Ash}}{\text{Wt. of sample taken}} \times \frac{100}{1}$$

Table 1: PROXIMATE COMPOSITION OF FEED STUFF

FEED STUFF	% CP	% LIPID	% CF	% ASH	% MC
FISH MEAL	71	15.03	1.42	9.83	3.4
GROUNDNUT CAKE	44.63	22	5.48	8.93	2.64
MAIZE MEAL	12.68	4	1.46	1.5	3.27
MELLON SHELL MEAL	6.56	7	25.2	5	5.2
PALM OIL	0	0	0	0	0
VITAMIN PREMIX	0	0	0	0	0

Table 2. Formulated diets and their proximate compositions

FEEDSTUFFS (g)	D1 (0% MSM)	D2 (25% MSM)	D3 (50% MSM)	D4 (75% MSM)	D5 (100% MSM)
Fishmeal (FM)	18.23	18.23	18.23	18.23	18.23
Groundnut Cake (GNC)	18.23	18.23	18.23	18.23	18.23
Maize meal (MM)	58.55	43.91	29.28	14.64	0
Melon Shell (MS)	0	14.64	29.28	43.91	58.55
PalmOil	3	3	3	3	3
Vitamin Premix	2	2	2	2	2
PROXIMATE COMPOSITION OF DIETS (%)					
Crude Protein (CP)	31.5	29.8	31.5	30.6	32.4
Crude Lipid	16	15	17	11	14.00
Crude Fibre (CF)	1.48	9	16.94	22.98	29.3
Ash	2.5	7	7	9.6	6
Moisture content	2.6	3.6	1.4	3.4	5

IV Biological Evaluations

The following parameters were evaluated;

1. Mortality

   This measure the death rate in the fishes as expressed below

   $$\%Mortality = \frac{\text{No of dead fish}}{\text{No of fishes stocked}} \times \frac{100}{1}$$

2. Specific Growth Rate (SGR)

   This is expressed as

   $$SGR = \frac{\text{Ln MFW (Mean final weight)} - \text{Ln MIW (Mean initial weight)}}{\text{Time in days}} \times 100$$

3. Food Conversion Ratio

   This is expressed as

   $$FCR = \frac{\text{Weight of food fed (Dry gram weight)}}{\text{Weight gain of fish (Wet gram weight)}}$$

4. Protein Efficiency Ratio

   This measure the protein efficiency ratio

   $$PER = \frac{\text{Weight gain of fish}}{\text{Protein fed}}$$

5. Apparent Net Protein Utilization (ANPU)

   This is expressed as

   $$\%\ ANPU = \frac{\text{Carcass protein gain (g)}}{\text{Protein fed}} \times 100$$

6. Apparent Digestibility Coefficient (ADC)

   $$\%ADC = 100 - \frac{(100 \times \%AIA \text{ of diet} \times \%\text{Nutrient in faecal})}{\%AIA \text{ of faecal} \times \%\text{Nutrient in diets}}$$

V Statistical analysis

The results for the feeding trial were subjected to one way Analysis of Variance (ANOVA) to establish the significant difference among the treatments. Means were separated using Turkeys test (Steel and Torrie, 1980, Duncan, 1955). Statistical software package Minitab release 14 was used for the statistical analysis while, Microsoft excel package was used for graphical analysis.

VI Results

From the result in Table 3 the mean weight gain (MWG) of the fishes differ significantly ($P<0.05$) from each other. Diet 4 recorded the highest mean weight gain (MWG) of 1.88g which was significantly higher ($P<0.05$) than other diets. This was followed by diets 3, 2, 5 and 1 respectively which exhibited the lowest MWG although, with no significant difference from each other ($P>0.05$). The feed conversion ratio (FCR) of the Diets differed significantly ($P>0.05$) from each other. Diets 2, 3 and 5 differed insignificantly from one another ($P>0.05$) while, diets 1 and 5 differed significantly from other diets ($P<0.05$). Diet 4 recorded the lowest FCR of 0.56 which was significantly lower ($P<0.05$) than other diets. Diet 2 followed closely diets 1 and 5 with 0.97 FCR value which were significantly higher ($P<0.05$) than diet 4. Moreover, diet 3 and 5 gave a significantly higher FCR values.The specific growth rate (SGR) differed significantly among the diets ($P<0.05$). Diet 4 recorded the highest SGR of 1.21 which differ significantly ($P<0.05$) from other diets. This was followed by diets 2 and 3 with SGRs of 1.15 and 1.06 respectively. Diets 5 and 1 recorded the lowest SGRs of 0.95 and 0.89 respectively. The protein efficiency ratio (PER) differed significantly from each other ($P<0.05$). Diet 4 showed the highest PER of 0.62 which differed significantly from the other diets. This was followed by Diets 2, 1, 3, and 5 with PERs of 0.04, 0.03, 0.03 and 0.03 respectively. The Apparent Net Protein Utilization (ANPU)

differed significantly ($P<0.05$). Diets 2 and 4 were the best among the Mellon shell meal based diets with ANPU of 2.68 and 2.61 respectively. Flowed by diet 3 with ANPU of 1.90 and diet 5 was the least value of 0.31. However, diet 1 had the highest ANPU of 9.51. The percentage mortality recorded in the experiment differed significantly from each other. Diet 4 showed the highest mortality of 54.16% which differed significantly from the other diets ($P<0.05$). This was followed by diets 5, 3, 1 and 2 with percentage mortalities of 20.83, 16.67, 16.65 and 12.50 respectively which differed insignificantly from each other ($P>0.05$). Table 4 shows the initial and final body composition of the fish after it had been fed mellon shell based diets for 56 days. The results indicated significant difference ($P<0.05$) in the initial and final body composition of the fish. Diet 1 recorded the highest ($P<0.05$) crude protein level which was significantly higher than the other diets. Diets 2, 3 and 4 followed closely exhibiting no significant difference ($P>0.05$) from one another though significantly higher ($P<0.05$) than diets 5 which recorded the lowest crude protein level. This is also evident in the digestibility co-efficient values obtained (Table 5), which was significantly high ($P<0.05$) for diets 2, 3 and 5 but significantly low ($P<0.05$) for diet 4. The initial body lipid composition of the fish was significantly higher ($P<0.05$) than the final body lipid composition at the end of the experiment. Diet 4 recorded significantly highest final carcass lipid composition followed by diet 5 which was equally significantly higher ($P<0.05$) than diets 2 and 3 which bore no significant difference ($P>0.05$) between each other. However, diet 1 recorded the lowest lipid in its final body composition. The percentage ash of the initial body composition of the fish differed significantly ($P<0.05$) from that of the final body composition, diet 2 was exhibited highest ash content differing significantly ($P<0.05$) from diets 1, 3 and 5. Moreover, diet 4 recorded the lowest ash content.Generally the final carcass moisture content differed significantly ($P<0.05$) from the initial save in the case of diet 5, 3 and 2 which were insignificantly different ($P>0.05$) from the initial value. Diets 4 and 1 differed significantly ($P<0.05$) from each other. Figure 1 showed the growth response curve of the fishes fed graded levels of melons shell meal. The growth was generally coherent from week 0 to week 2. From week 2, the growth response of individual diets changed with diet 1 recording a steady growth rate but with a decrease from week 2 through to week 4 and then picking up in week four through to week eight, diet one recorded the poorest growth response. Diet 2 had a rapid growth between week 0 and 2, the growth response from the end of week 2 through to week 6 increased at a slow but steady pace and increased rapidly from week 6 to week 8. Diet 3 recorded a steady growth from week 0 through to week 4, from week 4 the growth increased more rapidly climaxing at week 6 and then making a rapid fall in week 8. The growth response of diet 3 showed the greatest inconsistence expressing an optimum tolerance in week 6. Diet 4 expressed the greatest consistence in mean weight gain increasing steadily from week 0 through to week 8. Diet 5 expressed a gradual and consistent growth throughout the eight weeks of the experiment. Its growth was steady from week 0-4 and then recorded a significant increase from week 4 through to week 8. Generally Diets 4, 5 and 2 were most consistent in their growth response compared with diets 1 and 3.

Table 3: Growth performance of Nile Tilapia *(O. Niloticus)* fed with Mellon Shell Meal Meal based diets

Growth Parameters	D1 (100MM:0MSM)	D2 (25MM:75MSM)	D3 (50MM:50MSM)	D4 (75MM:25MSM)	D5 (100MM:0 MSM)	SD
Initial weight (g)	$1.1^{a} \pm 0.00$	$1.15^{a} \pm 0.07$	$1.30^{b} \pm 0.14$	$1.65^{ab} \pm 0.70$	$1.40^{b} \pm 0.14$	± 0.10
Final weight gain (g)	$1.81^{b} \pm 0.04$	$2.2^{a} \pm 0.13$	$2.36^{a} \pm 0.20$	$2.60^{a} \pm 0.01$	$2.37^{a} \pm 0.18$	± 0.14
Weight gain (g)	$0.71^{a} \pm 0.35$	$1.05^{a} \pm 0.05$	$1.06^{a} \pm 0.06$	$0.92^{b} \pm 1.3$	$0.97^{a} \pm 0.32$	± 0.60
FCR	$1.28^{a} \pm 0.21$	$0.97^{b} \pm 0.00$	$1.02^{b} \pm 0.19$	$0.56^{c} \pm 0.60$	$1.04^{b} \pm 0.33$	± 0.33
SGR (%)	$0.89^{a} \pm 0.04$	$1.16^{b} \pm 0.00$	$1.28^{b} \pm 0.03$	$0.82^{b} \pm 0.64$	$0.94^{b} \pm 0.32$	± 0.32
PER	$0.03^{a} \pm 0.00$	$0.04^{a} \pm 0.00$	$0.03^{a} \pm 0.00$	$0.62^{b} \pm 0.04$	$0.03^{a} \pm 0.00$	± 0.01
ANPU (%)	$9.52^{a} \pm 0.01$	$2.68^{b} \pm 0.01$	$1.90^{bc} \pm 0.01$	$2.61^{b} \pm 0.01$	$0.31^{c} \pm 0.01$	± 0.01
%Mortality	$16.65^{a} \pm 23.55$	$12.50^{a} \pm 5.89$	$16.67^{a} \pm 11.79$	$54.16^{b} \pm 53.03$	$20.83^{a} \pm 5.9$	± 0.33

Means with the same superscript along the row do not differ significantly (P<>.05)

Table 4: Initial and Final Body Composition of *Oreochromis niloticus* Fed Graded Levels of Mellon shell for 56 days

Body Composition Analysis (%)	Initial body Composition (%)	Final Body Composition					SD
		D1 (100MM:0MSM)	D2 (25MM:75MSM)	D3 (50MM:50MSM)	D4 (75MM:25MSM)	D5 (100MM:0MSM)	
Crude protein	$59.49^{c} \pm 0.03$	$62.49^{a} \pm 0.04$	$60.27^{b} \pm 0.07$	$60.03^{b} \pm 0.06$	$60.30^{b} \pm 0.01$	$59.60^{c} \pm 0.01$	± 0.04
Lipid	$34.11^{a} \pm 0.01$	$20.20^{d} \pm 0.01$	$21.21^{cd} \pm 0.02$	$22.10^{cd} \pm 0.01$	$25.20^{b} \pm 0.01$	$23.10^{c} \pm 0.01$	± 0.01
Ash	$12.30^{c} \pm 0.01$	$13.21^{b} \pm 0.01$	$13.77^{a} \pm 0.01$	$13.05^{b} \pm 0.01$	$8.54^{d} \pm 0.02$	$13.10^{b} \pm 0.01$	± 0.01
Moisture content	$3.20^{a} \pm 0.01$	$2.10^{c} \pm 0.02$	$3.30^{a} \pm 0.01$	$3.20^{a} \pm 0.01$	$2.80^{b} \pm 0.02$	$3.10^{a} \pm 0.01$	± 0.01

Means with the same superscript along the row do not differ significantly ($P>0.05$)

Table 5: Apparent Digestibility Coefficient (ADC %)

Parameters (%)	D2 (25% MS)	D3 (50% MS)	D4 (75% MS)	D5 (100% MS)	SD
Crude Protein (CP)	82.33[b]± 0.01	93.2[a] ± 0.10	68.94[d]± 0.01	75.86 [c]± 0.01	± 0.05
Crude Lipid	65.67[b]± 0.01	89.3[a] ±0.10	64.38[b] ± 0.01	38.97[c] ± 0.01	±0.05
Crude Fibre	90.13[b]± 0.01	94.2[a]± 0.01	79.48[c]± 0.01	70.02[d] ± 0.01	±0.01
Dry Matter	62.26[b]± 0.01	83.48[a] ± 0.01	42.5[c] ± 0.01	2.87[d] ± 0.01	± 0.01

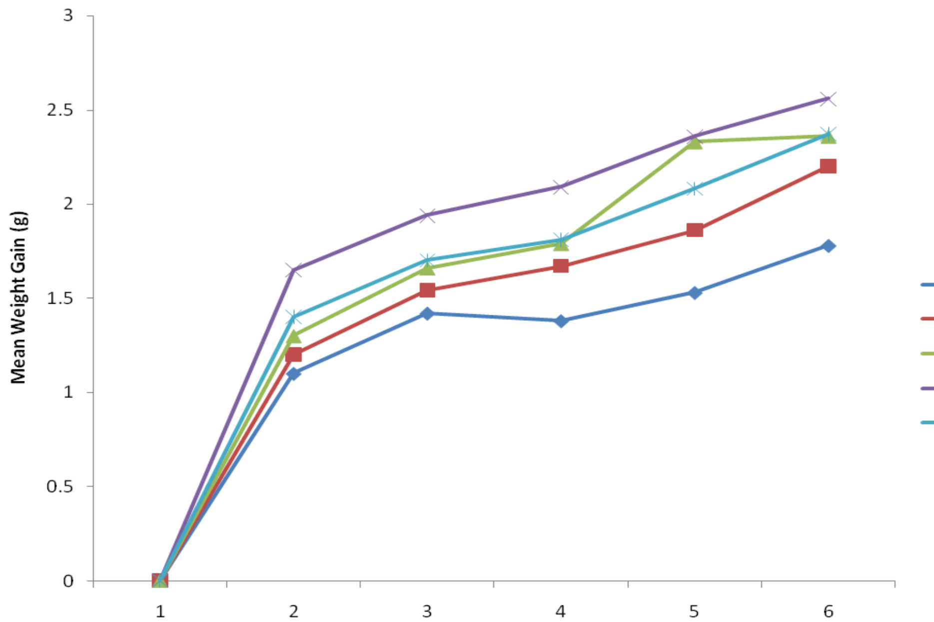

Fig. 1 Growth response of Oreochromis niloticus fed Melon Shell based diets for 56 days

VII DISCUSSION

The present study investigated the effect of replacement of maize with Mellon shell meal on the production of Nile tilapia *(Oreochromis niloticus).* The result obtained indicated utilization of Mellon shell by *Oreochromis niloticus*. Of all the diets Diet 4 recorded the best growth performance; this was reflected in the values obtained for MFWG, FCR, SGR, and PER (Table 4 and figure 1). Diet 4 exhibited the highest weight gain, lowest FCR, highest SGR, ANPU, and the highest PER among the experimental diets, this is in agreement with the work of Nwanna *et al.*, (2009), on the utilization of potato peel as dietary carbohydrate source in the diet of *O. niloticus,* as well as the investigation and results of Jesu *et al.*, (2008), on the utilization of various dietary carbohydrate levels by the freshwater catfish *Mystus montanus* (Jerdon). Although the Diet recorded the highest mortality, it was proven to be the best of the other experimental Diets by the values of its biological evaluation.Diets 2 and 3 expressed the second best growth performance; they expressed no significant difference in their growth parameters (P>0.05). The value of their growth parameters i.e. FCR, MFWG, SGR, PER and mortality optimum (Amanat and Nasser 2001; A. Jesu *et al*, 2008; Nwanna *et al.*,2009). Though expressing significant difference (P>0.05) in ANPU. Diet 5 recorded the poorest growth response indicating that 100% inclusion level was not tolerated by the fish. This was expressed in the values of its biological evaluation its high FCR, low MWG, SGR, PER and ANPU values. Nwanna *et al.*, (2009) observed that very high inclusion levels of unconventional dietary carbohydrate sources often result in poor performance of the fish. This was also confirmed in the work of Jesu *et al.*, (2008) when potato peel was fed to *O. niloticus*. The growth response of the control diet (diet 1) was the least which was in agreement with the reports of Solomon *et al.*, (2007) and Nwanna *et al.*, (2009). Fagbenro *et al.* (2000) showed favourable comparison of Acha (*Digitaria exilix*) meal with maize and sorghum meal as dietary carbohydrate source for Nile tilapia. Nwanna et al. (2003) discussed the effectiveness of replacing maize with Acha in the diets of Nile tilapia. Nwanna *et al.* (2004). Also verified that replacing maize with a non-conventional carbohydrate source Tamarind (*Tamarindus indica*) resulted in good growth of Nile tilapia and improved economic returns.The apparent digestibility coefficient (ADC%) for crude protein in the present study was in agreement with that reported by Hossain and Jauncey (1989), who observed that apparent digestibility coefficient for crude protein of fish meal in carp was 88.9%. This present study showed that O.*niloticus* digested the protein in mellon shell meal based diet as high as 93.2%. Generally the digestibility of the nutrient drastically declined at inclusion level higher than 50% mellon shell meal this can be as a result of the high fibre content of those diets as high fibre may reduce the digestibility of food (FAO, 2000).

VIII CONCLUSION

From the results of this study it can be deduced that the partial inclusion of mellon shell meal in the formulation of fish feed to supplement maize and other conventional carbohydrate sources is acceptable and useful in fish industry, though the complete replacement of maize at 100% appears to be unsuitable in the diet of *O.niloticus* but inclusion rate up to 75% was found appropriate in the diets of *O. niloticus* fingerlings.

IX RECOMMENDATION

Melon shell meal can be included in the diet of *Oreochromis niloticus* up to 75% inclusion level without any adverse effects on the growth. Therefore, fish farmers can have significant save in the inclusion rate of maize in the diets of tilapia production.

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