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Growth Performance and Haematological Response of *Oreochromis niloticus* Fed Varying Inclusion Levels of *Ocimum gratissimum* as Additive

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Abstract

This study was carried out to evaluate the use of *Ocimum gratissimum l*eaves on the growth performance and haematological parameters of *Oreochromis niloticus* juveniles. Five tanks (21.5x14.5x9cm^3) containing 10 *Oreochromis niloticus* juveniles were fed with five isonitrogenous diets (27.11% crude protein) containing varying inclusion of *O. gratissimum* (Control diet 0%, *O. gratissimum* T1=25%, T2=50%, T3= 75%, and T4= 100%). The fish were fed twice daily for an experimental period of 12 weeks. The fish in tank T3 (0.23inclusion of *O. gratissimum*) had the best weight gain 26.00±3.00g which ranges from 22.00±1.00 to 26.00±3.00g. The highest specific growth rate of 0.56±0.06 was recorded in tank T3with a range of 0.52±0.01 to 0.56±0.06. The highest food conversion ratio 1.25±0.09 was recorded in tank T1 (25%0.075 inclusion of *O. gratissimum*) with a range of 1.11±0.23 to 1.25±0.09. The highest protein efficiency ratio 0.03±0.01was also recorded in T3 (0.23 inclusion of *O. gratissimum*) with a range of 0.03±0.00 to 0.03±0.01. No mortality was recorded in all experimental tanks. The fish fed with *O. gratissimum* showed increase in haematological values of Red blood cell (RBC), (0.02±0.00 10^4µL), and White with blood cell (WBC), (15.25±0.007 10^2µL) compared to the values of fish fed with control diet Red blood cell (RBC) was 0.01±0.00 and White blood cell (WBC) was 12.65±0.07 10^2µL. There was reduction in the haematological value of the fish fed with *O. gratissimum* in Haemoblogin (HBG), (4.45±0.07 g/dL) compared to the value of fish fed with control feed Haemoblogin (HBG), (5.15±0.14 g/dL). The genotoxicity test that was carried out showed that the highest counts of micro nucleus were present in tank T4 while the lowest counts of micro nucleus were found in tank T0. A significant difference was recorded ($p<0.05$). It is concluded that using *O. gratissimum* leaves as feed for *O. niloticus* enhances the growth of the fish and has no negative impact on the health status of the fish. Therefore partial inclusion of 0.23kg of *O. gratissimum* to 100kg of fish feed should be encouraged because its contributed to the growth of fish and is of medicinal value.

Keywords: Growth performance, *O.niloticus, O.gratissimum,* Nutrient utilization, haematology, genotoxicity.

Introduction

Fish is one of the major diverse groups of animals mostly known to man with more than 20,500 species in existence. According to FAO (1985), the World fish production from capture fisheries and aquaculture has reached 121 tonnes. Decline in the availability will have a detrimental effect on the nutritional status of the citizenry particularly in the places where fish contributes

significantly to the protein intake of the people such as Nigeria where fish constitute over 40% of animal intake (Olatunde, 1989). Efforts should therefore be geared towards increased fish production through improved resource management matched with effective post-harvest handling, preservation and processing to prevent spoilage.

One of the major problems facing the aquaculture industry today is the high cost of fish feed. All over the world, there is constant search of the dietary feedstuff sources that will maximize growth and increase production within the shortest possible time, and at the lowest cost (Adewolu, 2008). This is because the traditional or conventional feedstuffs are becoming costly and less available, hence the need for unconventional feedstuff sources, especially those of plant origin. Adulterated feeds are equally much in the market thereby depriving fishes the right balanced meal which is needed for proper and timely growth (Amisah *et al.,* 2009). The cost of purchasing fish feed ingredients is high, hence the need to source for good alternatives which will enhance growth and proper development of fish (George *et al*., 1993).

Most leaf meals have been reported to provide essential nutrients required in livestock feeds, including fish (Ali *et al*, 2003; Bairagi *et al*, 2004; Adewolu, 2008) as in *cassava, alfalfa, Carica papaya, Leucaena leucocephala* and *Ipomea batatas* leaf meals respectively. *Ocimum. gratissimum* leaf meal has the potentials for use in feeds because of its nutrient content of energy, crude protein, lipids, ash and other essential nutrients (Edeoga *et al*, 2006). Its use however has been limited majorly by the presence of antinutritional substances, especially *safrole* which is a potentially dangerous compound that can inhibit digestion of cell walls in ruminants because of their antimicrobial activity, thereby decreasing productivity. *Ocimum gratissimum* commonly referred to as "scent leaf" is an herbaceous perennial grass. It is pantropical and widely naturalized in many regions (Nnabugwu, 2010; Odoemelam, *et al.,* 2012). It is also a known traditional medicinal plant used in curing different ailments, (Onajobi, 1986; Kokwaro, 1993). Some chemical compounds and active ingredients from this plant that makes it exhibit strong antimicrobial properties include Eugenol, Cinamate, Camphor and Thymol (Adebolu and Oladimeji, 2005; Matasyoh *et al.,* 2007). Fish farming cannot be successfully practiced without availability of adequate fish feeds which constitutes balanced diet needed for fish growth and development. Most feeds are farm-based and commercial fish feed have to be imported, using the limited foreign exchange of the country (Amisah *et al.,* 2009).

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However, available information on the use of *O. gratissimum* as feed ingredient in aquaculture diets is still scanty. There are no studies so far which reports utilization of scent leaf as fish feed ingredients on tilapia fishes. Scent leaf have the potential to be a supplier of macro and micro nutrients in a fish feed derived from a mixture of plant products. (George et al., 1993). Research has not been carried out on the use of *Ocimum gratissimum* leaves as feed for *Oreochromis niloticus.*

Therefore, the purpose of this study is to determine the effect of *O. gratissimum* leaves on the growth performance and stress response in *O. niloticus.*

Materials and Method

One hundred and fifty healthy juveniles of Nile tilapia fish, *Oreochromis niloticus* fish were purchased from Arobadi Fish farms in Ota Area of Ado odo Ota Local government Area of Ogun, Nigeria. The fishes were transported in an oxygenated fish polythene bag to the Marine Research laboratory of the University of Lagos.

Experimental Procedures

The fishes were acclimatized for 14days. After 14 days of acclimatization, 10 juvenile (54.2±1.68g) *O. niloticus* fish were measured and randomly transferred into each of the experimental culture tanks (21.5x14.5x9cm^3) using a scoop net. The water was filled to 2/3 of the volume of each tank (15 litres). Each of the tanks was cleaned and each of the tanks was filled with dechlorinated tap water. Suitable conditions were maintained by cleaning the tanks and constant changing of the water which took place weekly. Large quantities of fresh *Ocimum gratissimum scent leaves were obtained from Bariga market in Bariga, Lagos, Nigeria.* The scent leaf was sundried for 3 days. After sun drying for three days, it was then grinded with a blender to a powdered form and sieved to separate the powdered form from the shafts. The powered form was mixed with the formulated feed according to the level of inclusion (table 1) and pelletized.

The experimental feeds were formulated with *Ocimum gratissmum* added at 0% (control), 0.075kg, 0..15kg%, 0.23kg and 0.30kg ,each of the tanks were labelled in triplicates representing feeding regimes. as T_0, T_1, T_2, T_3, and T_4, respectively.

Table 1. Percentage of scent leaf and other ingredients compounded together to make the fish feed per 100kg

Parameters	T0	T1	T2	T3	T4
Fishmeal (FM72%)	12.5	12.5	12.5	12.5	12.5
Soyabean meal(SBM)	12.5	12.5	12.5	12.5	12.5
Groundnut cake(GNC)	37.3	37.3	37.3	37.3	37.3
Maize	34.7	34.7	34.7	34.7	34.7
Vitamin Premix	1.5	1.5	1.5	.5	1.5
Lysine	0.5	0.5	0.5	0.5	0.5
Methionine	0.5	0.5	0.5	0.5	0.5
Nacl	0.5	0.5	0.5	0.5	0.5
Ocimum gratissmum (Scent leaf)	-	0.075	0.15	0.23	0.30

Tank T0: Formulated feed (Control)
Tank T1: 0.075kg Inclusion of Occimum gratissum in fish diet
Tank T2: 0.15kg Inclusion of Occimum gratissum in fish diet
Tank T3: 0.23kg Inclusion of Occimum gratissum in fish diet
Tank T4: 0.03kg Inclusion of Occimum gratissum in fish diet

The fish were fed to satiation twice daily for 12 weeks. The daily feeding ratio was measured at the beginning of every week using a weighing scale. Feeding response was monitored and no mortality was recorded. The water was changed daily in order to avoid contamination of water by the uneaten feed and faeces.

Determination of Water Parameters

The water pH was measured with a Philip meter (model pH-009 111), with glass electrode. Dissolved Oxygen (DO) was measured with DO meter (model Eutex DO 600), Water temperature was determined by simple mercury thermometer, calibrated in centigrade (^{0}C).

Growth and Nutrient Utilization Parameters

The following indices were used to determine the biological evaluation of growth performance and nutrient utilization of the experimental fish.

The mean standard weight of the fish in each tank was determined at the beginning of the experiment and at end of every week. The weight of all the fish in each tank was measured using a weighing scale and mean value was calculated.

Weight Gain

The weight gained was calculated using the formula below:

Final weight (g) – Initial weight (g)

Specific Growth Rate

This is the percentage rate of change in the logarithm body weight. It was computed according to Hopkins (1992). The SGR was calculated using the formula below:

$$SGR = \frac{Log_e W_f - Log_e W_i X100}{\text{Times (in days)}}$$

Where W_f is final body weight and

W_i is the initial body weight

Food Conversion Ratio

This is the amount of unit weight of food that specimens were able to convert into unit muscle. It was determined by the formula below:

$$FCR = \frac{\text{Feed intake (g)}}{\text{Total weight gain (g)}}$$

Percentage Weight Gain
This was calculated using the formula below:

$$PWG = F\frac{\text{final weight - Initial weight}}{\text{Initial weight}} X\ 100$$

Hematology Determination
The blood samples were collected from the caudal peduncle with the aid of a 2 ml plastic syringe caudal vein using 5ml ethylene diaminetetraacetate (EDTA) as anticoagulant (AOAC,1995) Blood, 2.0 ml, was decanted in heparinzed bottles for determination of blood parameters. A compact Sysmex KX-21 was used to run the samples in whole blood mode and pre-dilute mode. The hematological parameters analyzed include White blood cells (WBCs), Red blood cells (RBCs), Hemoglobin (HGB), Packed cell volume (PCV), Mean corpuscular Mean corpuscular hemoglobin concentration (MCHC) and Platelets count (PLT).

Genotoxicity Determination
The genotoxity experiment was performed in the laboratory after twelve weeks of experimental feeding. The blood samples of each tank were smeared on a glass plate and another glass was used to spread it on the glass slides. These slides were later viewed under the microscope.

Proximate Analysis: The proximate composition for experimental diets and fish carcass were measured according to AOAC (1995) method.

Statistical Analysis
All values were recorded as mean standard deviation and subjected to one-way analysis of variance (ANOVA) using SPSS 15 for window software package. Significant means were subjected to a multiple comparison test (Tukey) for post hoc comparison at $P < 0.05$ level.

Results

Water Quality Parameters
The water quality parameters were measured in all the experimental tanks. The results are presented in table 2 below:

Proximate Analysis Composition of Scent Leaves
The proximate composition of scent leaf *O.gratissimum* is shown in Table 3. The crude protein percentage of is 27.11%, the fat percentage of *is* 2.50%, the fibre percentage of *is* 20.99%, the ash percentage of *is* 11.00%, and the moisture percentage of *is* 8.55% and the energy of *O.gratissum* is 1995 kcal/kg.

Table 2. Water Quality Parameters of the Experimental Tanks

Parameters	Range	Mean and Standard Deviation
pH	6.5- 7.2	6.8±0.27
Dissolved oxygen (DO)	6.5–6.8mg/l	6.7±0.10
Temperature	26^0C-30^0C	28±1.38

Table 3: Proximate Analysis Composition of *O.Gratissimum* Leaves

Parameters	Composition
Protein (%)	27.11
Fat (%)	2.50
Fibre (%)	20.99
Ash (%)	11.00
Moisture (%)	8.55
Energy (Kcal/kg)	1995

Growth Parameters and Nutrients Utilization of Nile Tilapia Fed with Scent Leaf
The growth and nutrient utilization of *O. niloticus* fed with *O. gratissimum* at different levels of inclusion is shown in table 4. The initial weight of the experimental fish were not significantly different ($p>0.05$) from each other. The final weight of the experimental fish in tanks T1, T3, and T4 were similar and were different from the final weight of T2 and control. The average weight gain of fish (26.00±3.00g) was recorded by fish fed with 0.23kg inclusion of *Ocinum gratissimum* diet while the least was recorded in the control T0. The fish in tanks T1 and T2 have average weight gain that were not significantly different ($p>0.05$) from each other but they were significantly different ($p<0.05$) from the fish in tanks T0, T3 and T4. The highest SGR was recorded in tank T3 with 75% inclusion of scent leaf while the least

was measured by fish fed with 0.3kg inclusion of scent leaf (T4). There was no significant difference ($p>0.05$) between the specific growth rate of fish in T0 and T3 but there were significant difference from T1, T2 and T4.

The highest food conservation ratio (FCR) was recorded in T1 that has 25% feed intake in diet while the lowest and the best FCR was recorded (T0) by fish fed in control. The FCR of the fish were significantly different ($p<0.05$) from each other. The protein efficiency ratio (PER) was similar across board. There was no mortality recorded among the fish in all experimental tanks.

Haematological Parameters of Nile Tilapia Fed with Scent Leaf

The haematological studies for the fish in treatment tanks showed that for white blood cells (WBC), there was no significant difference ($p>0.05$) among the fish in tanks T2, T3, and T4; (50, 75 and 100% inclusion of *O. gratissimum* respectively), but they were significantly different ($P<0.05$) from the fish in tanks T1 and T0 (25% and control). The white blood cell count (WBC) increased from the range (10.65±0.07) in T3 to range of (15.25±0.07) in tank T4 having 75 and 100% inclusion of *O. gratissimum* respectively. For the red blood cell count (RBC), there was no significant difference across the fishes in tanks T2, T3, and T4 but they were significantly different ($p<0.05$) from the fish in tank T1 and T2. The result showed that there was slight increase in the RBC count, which range from 0.01±0.00 to 0.2±0.00 across board. The haemoglobin concentration HGB showed that there was great difference between each tanks prior to the control, the control had the highest HGB count. Packed cell volume (PCV) showed there was no difference ($p>0.05$) among the fishes in tanks T0 and T2 which measured the highest, Tank T2 measured the lowest with (0.04±0.00b). LYMPH ranged from its lowest measurement in tank T1 (7.15±0.07) to its highest range in tank T4 (11.30±0.14). MIC measured highest in tank T4 (1.30±0.14) and lowest in tank T0 (0.00±0.00). GRAN had its highest measurement in tank T4 (2.95±0.07) and its lowest measurement in tank T0 (1.20±0.00). HGB ranged from its highest value in tank T0 (5.15±0.14) to (1.75±0.07) in tank T2 which was its lowest range. The MID percentage (%) was high in tank T0 measuring (9.30±0.14d) and it was low in tank T3 (7.10±0.14). HCT has its highest reading in tank T4 (0.05±0.07) but there was no significant difference across board in other tanks. Tank T2 measured highest PLT (411.00±1.41) ranging to tank T4 which is the lowest (123.50±0.71). MPV measured highest in tank T3 (93.50±0.07) and lowest in tank T4 (83.50±0.00). The table 5 below

Table 4. Growth Parameters and Nutrients Utilization of *O. Niloticus.*

Parameters	T0	T1	T2	T3	T4
Initial Weight	53.67±1.53^{a}	52.33±0.58^{a}	53.67±3.21^{a}	55.67±1.53^{a}	55.67±1.53^{a}
Final Weight	77.67±3.06^{ab}	76.67±1.53^{a}	78.33±3.06^{ab}	80.67±1.53^{b}	80.00±2.00^{ab}
Weight Gain	22.00±1.00^{a}	24.33±1.53^{ab}	24.67±1.53^{ab}	26.00±3.00^{b}	25.33±3.00^{ab}
SGR	0.53±0.09^{a}	0.55±0.03^{a}	0.54±0.05^{a}	0.56±0.06^{a}	0.52±0.01^{a}
PER	0.03±0.01^{a}	0.03±0.00^{a}	0.03±0.00^{a}	0.03±0.01^{a}	0.03±0.00^{a}
FCR	1.11±0.23^{a}	1.25±0.09^{a}	1.16±0.08^{a}	1.15±0.21^{a}	1.13±0.05^{a}

[1]Pooled standard error; Mean in the same row with the superscript are not significantly different from each other, P (>0.05).

shows the haematological parameters of Nile tilapia (*O. niloticus*), fed with *O. gratissimum*.

Genotoxicity Analysis

Various micro nucleus cells were seen when the slides were viewed under the microscope. The test that was carried out showed that the highest counts of micro nucleus were present in tank T3 while the lowest counts of micro nucleus were found in tank T4.This indicates a significant difference ($p<0.05$).

Table 5. Haematological Parameters of Nile Tilapia Fed with Scent Leaf

Parameters	T0	T1	T2	T3	T4
WBC	12.65±0.07^{c}	12.20±0.14^{b}	14.35±0.07^{d}	10.65±0.07^{a}	15.25±0.07^{e}
LYMPH	7.20±0.14^{a}	7.15±0.07^{a}	9.40±0.14^{c}	8.15±0.07^{b}	11.30±0.14^{d}
MIC	0.00±0.00^{a}	0.10±0.00^{a}	0.35±0.07^{b}	0.75±0.07^{c}	1.30±0.14^{d}
GRAN	1.20±0.00^{a}	1.35±0.07^{b}	1.70±0.01^{c}	1.80±0.00^{c}	2.95±0.07^{d}
LYMPH%	55.80±0.85^{a}	57.20±0.42^{b}	59.55±0.07^{c}	76.00±0.57^{e}	73.55±0.07^{c}
MID%	9.30±0.14^{d}	8.00±0.14b^{c}	8.30±0.14^{c}	7.10±0.14^{a}	7.70±0.14^{b}
GRAN%	14.70±0.28^{d}	15.10±0.14^{d}	16.45±0.07^{c}	17.40±0.14^{b}	18.60±0.00^{a}
HGB	5.15±0.14^{e}	4.45±0.07^{e}	1.75±0.07^{b}	4.35±0.07^{c}	3.70±0.14^{a}
RBC	0.01±0.00^{a}	0.01±0.00^{a}	0.02±0.00^{a}	0.02±0.00^{a}	0.02±0.00^{a}
HCT	0.00±0.00^{a}	0.00±0.00^{a}	0.00±0.00^{a}	0.00±0.00^{a}	0.05±0.07^{a}
PLT	328.00±2.8^{d}	292.00±2.83^{c}	411.00±1.4^{e}	243.00±1.41^{a}	123.50±0.71^{b}
MPV	88.50±0.00^{b}	85.50±0.07^{a}	87.00±0.07^{a}	93.50±0.07^{b}	83.50±0.00^{a}
PDW	13.55±0.00^{a}	133.50±0.00^{c}	16.30±0.01^{b}	14.45±0.01^{ab}	15.55±0.00^{ab}
PCT	0.28±0.00^{e}	0.25±0.00^{d}	0.04±0.00^{b}	0.22±0.00^{c}	0.10±0.07^{a}

[1]Pooled standard error; Mean in the same row with the superscript are not significantly different from each other, P (>0.05).Keys: WBC-white blood cell; HGB- Hemoglobin; RBC-red blood cell; HTC-haematocrit, MCV-mean corpuscular volume; MCH-mean corpuscular haemoglobin; MCHC-mean corpuscular haemoglobin concentration; RDW-CV - red blood cell distribution width (statistically expressed as coefficient of variation); RDW-SD -red blood cell distribution width (statistically expressed as standard deviation; MPV – mean platelet volume; PDW -platelet distribution width; PCT -platelet haematocrit.

Table 6. Result of Genotoxicity Analysis

Parameters	T0	T1	T2	T3	T4
BL	0	1.15±0.30^{a}	0.85±0.33^{a}	1.83±0.56^{a}	1.33±0.36^{ab}
BN	1.25±0.25^{a}	2.00±0.56^{a}	2.15±0.60^{a}	3.15±1.30^{a}	1.00±0.58^{a}
LB	0.79±0.30^{a}	1.00±0.40^{a}	2.00±0.75^{a}	2.00±0.72^{a}	0.50±0.35^{a}
MN	1.25±0.25^{a}	2.00±0.55^{a}	2.25±0.65^{a}	3.00±1.05^{ab}	1.00±0.35^{a}
NT	1.00±0.25^{a}	1.00±0.45^{a}	2.00±0.78^{a}	2.00±0.72^{ab}	0.50±0.35^{a}

[1]Pooled standard error; Mean in the same row with the superscript showed significant difference from each other, P (<0.05).Keys: Blebbed cell (BL) ml L^{-1}, Binucleated cell (BN) ml L^{-1}, Lobed cell (LB) ml L^{-1}, Micro nucleated cell (MN) ml L^{-1},Notched cell (NT) ml L^{-1}

Discussion

A number of plants are continued to be investigated for their potential in supplementing or even replacing some of these fish feed ingredients. Higher crude protein content 27% was reported for *O. gratissimum* leaf meal. This value was higher and does not agree with (Chen *et al*., (2003) who observed 23% crude protein content (CP) in the same leaves. The difference might be attributed to differences in environmental conditions such as soil types, harvesting time and processing methods.

The values of the water parameters used for this study are within the acceptable ranges for aquatic life survival and agrees with chapman, (2000) who reported that the optimum growth of Nile tilapia, *Oreochromis niloticus*, requires 28^0C- 30^0C, 6.5-9.0 pH and not less than 5mg/l dissolved oxygen in the rearing water.

All the experimental diets were accepted by *Oreochromis niloticus* juvenile, indicating that the levels of incorporations of *O. gratissimum* leaf meal did not affect the palatability of the diets. It helped in the survival of the fish. This might be attributed to the processing technique which involved proper drying and grinding of *O. gratissimum* leaves into fine powder and thoroughly mixing it with formulated feed and also adding the right amount of warm water to help incorporate the scent leaf powder into the feed thereby increasing its palatability in *Oreochromis niloticus* juvenile. This agrees with Chen *et al*., 2003 who worked on *O. gratissimum* and stated thatsScent leaf has low levels of antinutrients and thus, indicate their high nutritional quality.

Better growth and nutrient utilization were achieved at high levels 0.23kg of inclusion of scent leaf in diet, this agrees with Amisah, (2009) who stated that, Leucana *leucocephela* leaf meal in the diets of *Oreochromis niloticus* at 25.5% inclusion did not affect growth, however, at high levels of inclusion, 50% or more, the growth of *Oreochromis niloticus* was diversely affected.

No mortalities was recorded throughout the period and, therefore, the meal did not have any deleterious effects on the fish.

There was increase in the values of the white blood cell, (WBC), red blood cell, (RBC), haemoglobin concentration, (HBG) and packed cell volume (PCV) of *Oreochromis niloticus* fed *O. gratissimum* diet compared with those fish fed with control diet (0% scent leaves). This is not in agreement with Ayoola, (2011) who recorded slight decrease in the values of haematological parameters of the *Clarias gariepenus* fed with poultry hatchery waste compared to those fed with compounded feed (control).The increase that was observed in the haematological parameters of fish fed scent leaves inclusion in the diet is in agreement with the findings of Joshii *et.al.,* (2002) who stated that the survival of fish can be correlated with increase in antibody production which helps in the survival and recovery.

The increase in WBC may be due to increase in leucopolesis as a means of combating stressor in the body system of fish, similar findings were recorded by Ugwumba (2003). In *Clarias gariepenus* under confinement due to acclimated for 7 days. These changes in white blood cell have been reported to play important roles in the assessment of the state of health of *Clarias gariepenus* (Ezeri, 2001).

The increase in the red blood cell (RBC) and haemoglobin concentration may be attributed to the increase in the size of the fish as a result of growth in the fish. This is in agreement with Das (1965) who reported that both the haemoglobin contents and Erythrocyte counts (red blood cell) tend to increase with length and age of the fish. The increase in haemoglobin concentration could also be as a result of increase in the activity of the fish, *Oreochromis niloticus* fish are naturally active. This agrees with Eisler (1999) who suggested that there was a correlation between haemoglobin concentration and activity of fish. The more active fishes tend to have high haemoglobin values than the more sedentary ones.

The result of genotoxicity showed that the highest counts of micro nucleus were present in tank three (T3,0.23kg of *O. gratissimum* inclusion) and the lowest count was recorded in tank four (T4,0.3kg *O.gratissimum* inclusion) and this indicate significant difference ($P<0.05$).

Conclusion

In conclusion, *Ocimum gratissimum* leaves have the potential to make considerable contributions to growth of Nile tilapia (*Oreochromis niloticus*). *O. gratissimum* leaves can be used as additive in the diet of *Oreochromis niloticus* thereby reducing cost of feeding.This study has demonstrated that *O. gratissimum* leaves could be included in the diet of *Oreochromis niloticus* without any negative effects on the growth but for effective nutrients utilization, It is advisable to include *O. gratissimum* leaves at moderate average concentrations such as 0.23kg level of inclusion. *Ocimum gratissimum* leaves are available locally in the tropics and can be obtained throughout the year. It is therefore economical to partly include *O. gratissimum* leaves powder in *Oreochromis niloticus* diets.

References

AOAC, (1995). Association of Official Analytical Chemists. Official Methods of Analysis. 16 Edn. AOAC,Arlington, Virginia, USA.

Adebolu, T.T. and Oladimeji, S.A. (2005). Antimicrobial activity of *Ocimum gratissimum* on selected diarrhea causing bacteria in South Western Nigeria. *African Journal of Biotechnology,* 4(7): 682–684.

Adewolu, M.A. (2008). Potentials of potato leaf meal as dietary ingredient for *Tilapia zillii* fingerling. *Pakistan Journal of Nutrition,* 7(3): 444–449.

Ali, A., Al-Asgal, N.A., Al-Gaily, S.M. and Ali, S. (2003). Effect of feeding different levels of alfalfa meal on the Growth performance and body composition of Nile tilapia fingerlings. *Asian Fisheries Science J.,* 6: 59 – 69.

Amisah, S. Oteng, M. A. and Ofori, J. K. (2009). Growth performance of Nile tilapia fed varying inclusion levels of leucaena leucophela leaf meal. *J. Appl. Sci. Environ*., 13(1): 21-26.

Amisah, S. Oteng, M. A. and Ofori, J. K. (2009). Growth performance of the African catfish, *Clarias gariepimus,* fed varying inclusion levels of *Leucaena leucocephala* leaf meal. *J. Appl. Sci. Enviro.,* 13(1): 21-26.

Ayoola, S. O. (2010). Modern Fish Farming Techniques (Aquaculture). Glamour books Ltd. Dugbe Ibadan, Nigeria. 180pp.

Ayoola, S. O. (2011). Haematological Characteristics of Clarias (Buchell, 1882) Juveniles fed with poultry hatchery waste. *Iranica Journal of Energy and Environment*, 21: 18-23.

Bairagi, A., Sarkar, G.K., Sen, S.K. and Ray, A.K. (2004). Evaluation of the nutritive value of *Leucaena leucoephala* leaf meal, inoculated with fish intestinal bacteria *Bacillus subtilis* and *Bacillus circulans* in formulated diets for *rohu, labeo rohita* (Hamitton) fingerlings. *Aquaculture Research, 35(5): 436-496*.

Chapman, F.A. (2000). Aquaculture. Department of Fisheries and Aquatic Sciences, Cooperative Extension Service. *Institute of Food and Aquacultural Sciences*, University of Florida, Gainesville.

Chen, C.-C. Hsu, J.-D. Wang S.-F (2003). "Hibiscus sabdariffa extract inhibits the development of atherosclerosis in cholesterol-fed rabbits," *Journal of Agricultural and Food Chemistry*, 51(18) 5472–5477.

Das, B. C. (1965). Age-related Trends in the blood chemistry of fish, *Catla catla*. *Geronotologica*, 10: 47-64.

Ezeri, G.N.O. (2001). Haematological response of tilapia to bacteria infection and prophylactic treatment with antibiotics. *Journal of Aquacultural Science*, 16: 22-44.

Fagbenro, O.A. (2003). Feedstuff and dietary Substitutiuon for Farmed fish in Nigeria. Paper presented at Pan African Fish and Fisheries Conference Cotonou, Benin Republic. Book of Abstracts. 276pp.

FAO (1985). Aquaculture potential in African documentation issued on the occasion of the world food summit in Rome, November 1985. Rome FAO. 20pp.

George, F., Harinder, P.S. Makkar and Becker (1993). Products from little researched plants as aquaculture feed ingredients. Department of Animal Nutrition and Aquaculture, University of Hohenheim, Stuggart Germany. http://www.fao.org/DOCREP/ARTICLE/ AGRIPPA/551_EN.HTM

Hopkins, Kevin D. (1992). Reporting Fish Growth: A Review of the Basics. *Journal of the World Aquaculture Society*. Volume 23, (3) 173–179.

Joshii, P.K., Harish, D. and Bose, M. (2002). Haematological changes in the blood of Nile tilapia. *Ecotoxicological Environmental Monitoring*, 12(2): 119-122.

Kokwaro, J.O. (1993). Medicinal Plants of Eastern Kampala, Nairobi and Dar-essalaam Eastern *Africa Literature Bereau*. 106–115pp.

Matasyoh, L.G., Matasyoh, J.C., Wachria, F.N. Kinyua M.G., Mingai Thairu, A.W. and Mukiama, T.K. (2007). Chemical Composition and Antimicrobial Activity of the Essential Oil of *Ocimum gratissimum* L growing in Eastern Kenya. *African journal of Biotechnology* 6(6): 760–765.

Odoemelam, V.U., Nwaogu, K.O., Ukachukwu, S.N., Esonu, B.O., Okoli, I.C., Etuk, E.B., Ndelekwute, E.K., Etuk, I.F., Ogbuewu, I.P. and Kadurumba, O.E. (2012). Performance of Broiler Chickens Fed *Ocimum gratissimum* L. Supplemented Diets. *Proc. 6th Ann. Conf. Nig. Soc. for Indigenous Knowledge and Devpt. (NSIKAD). June 5th-7th MOUA, Umudike.* 15-16pp.

Olatunde A.A. (1989). Some aspects of the biology of *Synodotis schall* (Blocch-Schneider) in Zaria, *Nigeria Journal of Aquatic Sciences*, 4: 49–54.

Onajobi, F.D. (1986). Smooth Muscle Contracting Lipid-soluble Principles in Chromatographic Fraction of *Ocimum gratissimum*. *Journal of Ethnopharmacology,* 18: 3–11.

Reddy, P. M. and Bashamohideed, M. (1989). Fenvalerate and cypermethrin induced changes in the haematological parameters of *Cyprinus carpio. Acta Hydrochim. Hydrobiology,* 17: 101-107.

Ugwumba, A. A and Ugwumba A.O (2003). Aquaculture options and the future of fish supply in Nigeria. *The Zoologist*: 2 95 –98.

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