



EFFECT OF FEEDING GRADED LEVELS OF WASTE *TELFARIA OCCIDENTALIS* (FLUTED PUMPKIN) LEAVES IN THE DIET OF HETEROCLARIAS FINGERLING USING THE INDOOR PLASTIC AQUARIA,

GANNA, E.S^{1*}, YISA, A.T² AND EGBUDU D.A³

^{1&3}Department of Animal Science, Faculty of Agriculture, University of Abuja, Nigeria

²Department of Water Resources, Aquaculture and Fisheries Technology, Minna, Niger State

Abstract

The efficacy of the effect of wasted *Telfairia occidentalis* (fluted pumpkin leaves, WFPL) as an ingredient in the diet of African catfish hybrid, (*Heteroclarias*) fingerlings, of mean initial weight $0.23 \pm 0.17g$ were evaluated over a 60 day growth period, Five experimental diets were formulated at 0% (control), 5%, 10%,

Keywords

Telfairia occidentalis, African catfish hybrid and unconventional feeds

INTRODUCTION

Fish feed is the major cost variable in aquaculture representing sixty percent of the total operating cost. The utilization of cost effective feeds would therefore improve the profitability of the aquaculture business. Commercial aquaculture feeds was traditionally based on fish meal as the main source of protein (Eyo, 2001).

The *Heteroclarias* is one of the most commonly farmed species in the world (Ajayi *et. al* 2007). It is also commonly a hybridization of *Heterobranchus spp* and *Clarias gariepinus* to create variants even more suitable for farming in various conditions

Materials and methods

Experimental site
The experiment was carried out at the Faculty

15% and 20% graded levels of wasted fluted pumpkin leaves meal. A control diet without wasted fluted pumpkin leaves was formulated, the 60-day feeding experiment was conducted in an indoor plastic aquaria, each treatment had three replicates, Fish fed 15% *Telfairia occidentalis* leaves meal recorded the best growth performance in body weight gain of 0.64% and Mean Growth Rate (MGR) value of 8.61, Though other values of Mean Growth Rate were 5.59, 6.86, 7.06 and 5.38% respectively and those values were significantly different from each other. 10% diet of *Telfairia occidentalis* leaves meal recorded the best Survival Rate (SR) value of 76.68%, the 5% inclusion recorded the best Feed Conversion Ratio (FCR) of 5.20, while that of Protein Efficiency Ratio (PER) of 1.76 was best recorded in 0% (control) diet of wasted fluted pumpkin leaves. Although, the best Economic Weight Gain (EWG) of 13500g was recorded for fish fed on the 15% diet of *Telfairia occidentalis* leaves meal. There were no significant difference between the fish fed with control diet and the other experimental diet ($P > 0.05$), the study demonstrated the *Telfairia occidentalis* leaves meal can be best included in the diets of *Heteroclaris* fingerlings at the inclusion level of 15% for African catfish (*Heteroclaris* hybrid) fingerlings.

Of Agriculture, University of Abuja. The project site is located in latitude 8.55°N and 90°E with an annual rainfall ranges from 1,145-1631mm. the temperature in the dry season is between 30.4-35.1°C and 30.2°C during the rainy season. Relative humidity is about 60% during the rainy season and 30% during the dry season. It therefore covers a total land mass of 65sq.km (65000hactre) (Abuja Geographical Information System- AGIS) This experiment was carried out in the Animal Science Laboratory Complex with fifteen circulating system comprised of 25 liters plastic aquaria. Each aquarium has a water holding capacity of 25 liters. All the aquaria were fitted with aerator devices. The aquaria dimension measured 24cm x 21cm x 44cm. The unsold and spoilt fluted pumpkin leaves of *Telfairia occidentalis* that had been left over for about 2-3 days were collected from Gwagwalada market in Abuja-F.C.T Nigeria. The samples were sun cured, crush and weighed in 350g batches. One hundred and fifty *Heteroclaris spp* fingerlings were purchased at a private farm called Jiya hatchery Minna, in Niger State.

Telfairia occidentalis leaves constituted the feed treatments for *Heteroclaris* spp. The proximate composition of fluted pumpkin is shown on Table 1 while the mineral content of *Telfairia occidentalis* is represented on Table 2.

The experiment had five dietary treatments of 5%, 10%, 15% and 20% levels including the control. The treatments were replicated three times. The compound feed for this experiment was at 35%.

Before the commencement of the experiment, a 7 – day's adaptation period was allowed so that the fishes could adapt to the aquaria. During this period, the fishes were fed with commercial feed i.e. copen. Each diet were then further analyzed to determine the Crude Protein (CP), Crude fibre (CF), Nitrogen Free Extract (NFE), Metabolizable Energy (ME), Crude Fat (CF), Ash Content etc.

The experimental fish were reared in the circulating system comprising of fifteen 25 liters of plastic tanks. A water flow rate of 1.31/minute and temperature of $27 \pm 1^{\circ}$ C was maintained. The fish was stocked at the rate of 10 fishes per tank and each treatment was replicated. Prior to the commencement of the experiment, the fish were acclimatized for one week. The fish were fed three times daily i.e. morning 7:30am – 8:00am, Afternoon 12:00 noon – 12:30pm, and Evening session from 5:00pm – 5:30pm. The quantity of feed given to the fish was weighed 1.2g to 1.5g and feeding rate was adjusted accordingly after one week interval.

Sampling was carried out weekly to determine growth and other trait using sensitive electronic weighing balance and other equipment. Sampling was usually carried out in the morning between 7:30am – 9:30am to minimize stress. Survival and mortality rates were noted.

The stocking rate was 10 fishes per aquarium. The treatment were arranged in the 15 aquaria in a complete Randomized Design (CRD) with three replicates. In other words the fishes were randomly allocated to the fifteen plastic tanks making the total number of one hundred and fifty fishes of *Heteroclaris* fingerlings.

Proximate analysis was carried out according to A.O.A.C. 2002

Data collected were subjected to statistical analysis and the analysis of variance was used to separate means using the Duncan's Multiple Range Test to (Steel and Torrie, 2000).

RESULTS AND DISCUSSION

The result of proximate composition of *Telfairia occidentalis* (Analyzed value) is presented in table 1 while its mineral content also presented in table 2. Table

Furthermore, the result of Analyzed feed of *Telfairia occidentalis* (fluted pumpkin) leaves meal fed to *Heteroclaris* fingerlings is shown table 4. Results of the growth performance of *Heteroclaris spp* fingerlings fed diets containing graded levels of wasted fluted pumpkin leaves (WFPL) are presented in table 5. The last table, table 6 show the physiochemical parameter of the water measured In table 3 (showing the growth performance) there was significant difference ($P < 0.05$) between the treatments on the observed body weight gained.

The *Heteroclaris spp* fingerlings fed with the 15% (control) of WFPL diet seemed to have the highest weight gain value of 0.64g, There was significant difference ($P < 0.05$) on the length by the *Heteroclaris spp* fingerlings. *Heteroclaris spp* fingerlings fed with the 0% (control) and 5% wasted fluted pumpkin leaves diets had the highest length measurement values of 1.08cm and 0.99cm which were not comparable ($P < 0.05$) to that of *Heteroclaris spp* fingerlings fed with the 20% and 15% WFPL diets which had the values of 0.95cm and 0.90cm respectively, while that of 10% WFPL tend to have the lowest length measurement value of 0.65cm.

There was no significant difference ($P > 0.05$) of treatment on the observed feed intake by the *Heteroclaris spp* fingerlings since they were fed at the same level of feed gave the value of 1.50g respectively.

There were significant difference ($P < 0.05$) of treatment on Feed Conversion Ratio (FCR) by the *Heteroclaris spp* fingerlings. The *Heteroclaris spp* fingerlings fed with the 15% and 20% fluted pumpkin leaves (FPL) diets had the highest FCR values of 3.78g and 3.74g, while that of the 10% and 15% gave the lowest values of 3.09g and 2.20g respectively, with 0% (control) inclusion level of 1.41g had the lowest feed conversion ratio.

There was significant different ($P < 0.05$) of the experimental diets on the observed protein intake (PI) by *Heteroclaris* fingerlings. The protein intake tend to increase as the level of fluted pumpkin leaves increased in the diet except for the 5% inclusion level. The *Heteroclaris* fingerlings fed with the 20% and 15% of WFPL diet seemed to have the highest values of 3.00 and 2.80g respectively, comparable to that of 0% (control) and 10% which gave the values of 2.61g and 2.60g, while that of 5% comparable ($P < 0.05$) tended to have the lowest

The Protein Efficiency Ratio (PER) of the mean were significantly different in the row between 5%, 10% and 20% than that of the 0% (control) and 15% respectively. There was significant different ($P < 0.05$) between treatments 20% and 15% which gave the highest values of 1.12 and 1.11g, while that of 0% (control), 5% and 10% are significantly ($P < 0.05$) different with the low values of 0.53g, 0.62g and 0.71g respectively.

There was significant difference ($P < 0.05$) of treatment on the observed Survival Rate (SR). The *Heteroclarais* fingerlings fed with the 10% of WFPL diets tend to have the highest survival rate value of 76.68% comparable ($P < 0.05$) to that of 20% which gave the value of 73.34%. The *Heteroclarais* fingerlings fed with 15% diet of wasted fluted pumpkin leaves have the value of 50.00%, while that of 0% (control) and 5% diet tend to have the lowest survival rate percentage value of 13.34% and 13.34% respectively which are significantly not different.

There was a significant difference ($P < 0.05$) of the treatment on the observed Specific Growth Rate (SGR) by the *Heteroclarais* fingerlings fed with 15% which tended to have the highest Specific Growth Rate (SGR) value of 0.01% as compared to that of 0% (control) diet which gave the value to of 0.002%, while the 5%, 10% and 20% tended to record the lowest values of 0.005%, 0.006% and 0.006% respectively .

There was a significant difference ($P < 0.05$) of fluted pumpkin leaves inclusion on the Mean Growth Rate (MGR) obtained. The lowest mean growth rate obtained on the *Heteroclarais* fingerlings fed on the 20% and 0% (control) have the values of 5.38% and 5.59% which was comparable to the mean growth rate obtained on the 5% and 10% fed *Heteroclarais* fingerlings of 6.86% and 7.06% respectively. The *Heteroclarais* fingerlings fed with the 15% fluted pumpkin leaves diet had the highest ($P < 0.05$) mean growth rate of 8.61%.

Table 1: Proximate composition of wasted fluted pumpkin (Analyzed value)

Ingredients	Fluted pumpkin (%)
Dry matter	92.33
Crude protein	14.96
Crude fat	15.85
Moisture content	6.67
Nitrogen Free Extract (NFE)	8.92
Crude fibre	26.08
Ash content	9.94

Source: (Adeniji *et al.*, 2011)

Table 2: The mineral contents of *Telfairia occidentalis*

Calcium	(1.4g/100g)
Sodium	0.17g/100g
Iron	0.16g/100g
Potassium	0.07g/100g

Magnesium	0.71g/100g
Zinc	0.08g/100g

Source: (Adeniji *et al.*, 2011)

Table 3: Growth performance of *Heteroclaris spp* fingerlings fed fluted pumpkin leaves % OF WASTED FLUTED PUMPKIN LEAVES (%)

PARAMETERS	0 (Control)	5	10	15	20	SEM
Initial body weight (g)	0.06 ^e	0.56 ^d	0.69 ^c	0.92 ^a	0.86 ^b	±0.17
Final body weight (g)	0.04 ^e	0.85 ^d	1.06 ^c	1.56 ^a	1.19 ^b	±0.23
Body weight gain (g)	0.02 ^e	0.29 ^d	0.37 ^b	0.64 ^a	0.33 ^c	±0.02
Initial length (cm)	5.96 ^a	4.55 ^b	4.43 ^c	4.44 ^c	4.28 ^d	±0.17
Final length (cm)	7.04 ^a	5.54 ^b	5.08 ^e	5.33 ^c	5.22 ^d	±0.19
Standard length (cm)	1.08 ^a	0.99 ^b	0.65 ^e	0.90 ^d	0.95 ^c	±0.04
Feed intake (g)	1.50 ^a	±0.02				
FCR	1.41 ^e	2.20 ^d	3.09 ^c	3.78 ^a	3.74 ^b	±2718.9
PI	2.61 ^c	2.33 ^d	2.60 ^c	2.80 ^b	3.00 ^a	±0.12
PER	0.53 ^d	0.62 ^c	0.71 ^c	1.12 ^a	1.11 ^b	±0.12
SR	13.34 ^d	13.34 ^d	76.68 ^a	50.00 ^c	73.34 ^b	±7.40
SGR	0.002 ^d	0.005 ^c	0.006 ^c	0.01 ^a	0.006 ^c	±0.001
MGR	5.59 ^b	6.86 ^{ab}	7.06 ^{ab}	8.61 ^a	5.38 ^b	±0.38
EWG	6750 ^b	3375 ^c	2250 ^d	13500 ^a	2250 ^d	±1140
Initial condition factor	0.68 ^e	0.73 ^d	0.75 ^c	0.77 ^b	0.80 ^a	±0.010
Final condition factor	1.34 ^e	1.37 ^d	1.40 ^c	1.43 ^b	1.47 ^a	±0.012
Standard condition factor	0.67 ^{ab}	0.65 ^c	0.66 ^{bc}	0.67 ^{ab}	0.68 ^a	±0.003

NS – Means in the same row with the same superscript are not significant using the Duncan's

Multiple Range Test(DMRT)

SEM – Standard error of mean

Table 4: Analyzed feed of *Telfairia occidentalis* (fluted pumpkin) leaves meal fed to *Heteroclaris* fingerlings % OF WASTED FLUTED PUMPKIN

PARAMETERS	0% (Control)	5%	10%	15%	20	SEM
% DM Content	13.15 ^c	14.77 ^a	13.84 ^b	12.91 ^d	12.06 ^e	±0.24
% Ash Content	20.75 ^a	18.56 ^b	15.02 ^d	15.14 ^c	14.94 ^e	±0.63
% Crude Protein	34.93 ^c	31.18 ^e	34.72 ^d	38.19 ^b	40.01 ^a	±0.81
% Crude Fibre	6.22 ^a	6.10 ^b	5.36 ^d	5.20 ^e	5.60 ^c	±0.11
% Oil Extract	23.25 ^c	24.01 ^b	25.33 ^a	22.11 ^d	20.64 ^e	±0.43
% NFE	1.70 ^e	5.55 ^d	5.75 ^c	6.45 ^b	6.76 ^a	±0.49

NS – Means in the same row having the same superscript are not significantly different

($P > 0.05$)

SEM – Standard error of mean.

Proximate Analysis of Feed

The results of the proximate analysis of feed fed to *Heteroclaris* fingerlings diets containing graded levels of fluted pumpkin leaves (FPL) are presented in Table 4.

There was significant difference ($P < 0.05$) of treatment on the observed feed samples. *Heteroclaris* fingerlings fed with 5% wasted fluted pumpkin tended to have the highest value of moisture content of (14.77%) which was not comparable ($P > 0.05$) to the moisture content by the *Heteroclaris* fingerlings fed with 10% and 0% (control) diets having the values of 13.84 and 13.15% respectively. Moisture content intake values by *Heteroclaris* fingerlings fed with 15% and 20% WFPL diets were (12.91%) and 12.06%), with *Heteroclaris* fingerlings fed with 20% WFPL diet having the lowest percentage moisture content intake.

There was also significant difference ($P < 0.05$) of the treatment on the Ash content obtained. *Heteroclaris* fingerlings fed with the 0% (control) WFPL diet seemed to have the highest value of 20.75% which was followed by *Heteroclaris* fingerlings fed with 5% diet having the percentage ash content value of 18.56%. However, values of ash content by *Heteroclaris* fingerlings fed with 15%, 10% and 20% WFPL diets gave (15.14%), (15.02%) and (14.94%) respectively, with *Heteroclaris* fingerlings fed with 20% WFPL diet showing the lowest percentage ash content value.

There was significant difference ($P < 0.05$) of treatment on the percentage Crude Protein content. The *Heteroclaris* fingerlings fed with 20% diet tended to have the highest percentage crude protein with the value of 40.01% which was comparable to the percentage crude protein by the *Heteroclaris* fingerlings fed with 15% and 0% diets, *Heteroclaris* fingerlings fed with 10% and 5% diets recorded the lowest percentage crude protein content values of 34.72% and 31.18% respectively.

There was significant difference ($P < 0.05$) of treatment on the obtained percentage crude fibre content. The *Heteroclaris* fingerlings fed with 0% (control), and 5% WFPL diets seemed to have the highest value of 6.22% and 6.10% which was comparable ($P < 0.05$) to the crude fibre content by the *Heteroclaris* fingerlings fed with 10%, 15% and 20% diets which had the values

of 5.36%, 5.20% and 5.60% which are significantly different from each other. The lowest value of percentage crude fibre was obtained from *Heteroclarias* fingerlings fed with 10% and 15% WFPL diets with 5.36% and 5.20%.

There was significant difference the treatments on the percentage Oil Extract obtained. The *Heteroclarias* fingerlings fed with 10% FPL diet tended to have the highest value of 25.33% which was followed by *Heteroclarias* fingerlings fed with the 5% diet having the oil extract value of 24.01%. However, the values of percentage oil extract by *Heteroclarias* fingerlings fed with the (control), 15% and 20% treatment gave (23.25%), (22.11%) and (20.64% Oil Extract) respectively, *Heteroclarias* fingerlings fed with 20% treatment yielded the lowest percentage oil extract content value of 20.64%.

There was significant difference on the observed percentage Nitrogen Free Extract (NFE) intake. The *Heteroclarias* fingerlings fed with the 20% tended to have the highest value of NFE intake (6.76%) which was comparable ($P < 0.05$) to the Nitrogen - Free - Extract by the *Heteroclarias* fingerlings fed with 15% diets having the intake values of 6.45%. Nitrogen - Free - Extract intake values by *Heteroclarias* fingerlings fed with 5% and 0% (control) WFPL diets were 5.55% and 1.70%, with *Heteroclarias* fingerlings fed with 0% (control) WFPL diet having the lowest NFE intake values of 1.70%.

Table 5: Economic implication of feeding *Telfairia occidentalis* (fluted pumpkin leaves WFPL) to *Heteroclarias* fingerlings OF FLUTED PUMPKIN TREATMENTS

PARAMETERS	0 (control)	5	10	15	20	SEM
Cost of feed (N/kg)	251.00 ^d	250.00 ^d	254.00 ^c	256.00 ^b	261.00 ^a	±1.07
Consumed (N/kg)	1.50 ^d	1.51 ^{cd}	1.52 ^c	1.53 ^{ab}	1.54 ^a	±0.004
Selling price (N/kg)	600	600	600	600	600	±0.22
Cost of Rearing (N)	500 ^a	450 ^e	455 ^d	457 ^b	456 ^c	±0.51
Profit	100 ^e	150 ^a	145 ^b	143 ^d	144 ^c	±0.51
Gross profitability (%)	20.00 ^e	33.33 ^a	31.87 ^b	31.29 ^d	31.58 ^c	±0.23
Feed cost efficiency	25.00 ^a	13.50 ^e	14.28 ^d	14.61 ^b	14.44 ^c	±0.02

NS - Means in the same row having the same superscript are not significant ($P > 0.05$)

SEM - Standard error of mean

Economic Implication

The feed cost per kilogram of the 20% diet tended to be the highest, having a value of N261.00 per kg and was comparable to that of 15% diet with a value of

N256.00 per kg, thus, the 0% (control) and 5% diets of fluted pumpkin leaves (FPL) gave the lowest feed cost value of N251.00 and N250.00 per kg which was comparable ($P>0.05$) to the feed cost diet of 10% with the value of N254.00

Heteroclarias fingerlings fed with the 20% and 15% WFPL had the highest cost of feed consumed having the values of N1.54 and N1.53 per day which were comparable ($P>0.05$) to the cost of feed consumed by *Heteroclarias* fingerlings fed with 10%, 5% and 0% (control) which gave the values of N1.52, N1.51 and N1.50 respectively.

Heteroclarias fingerlings fed with FPL diets tend to have the same selling price values of N600 from the control diet to the 20% diet.

Heteroclarias fingerlings fed with 0% (control) and 15% treatment had the highest rearing cost values of N500.00 and N457.00, while the *Heteroclarias* fingerlings fed with 20% and 10% FPL diets were comparable with the values of N456.00 and N455.00. Thus, the *Heteroclarias* fingerlings fed with 5% diet had the lowest rearing cost value of N450.00.

The profit obtained from the *Heteroclarias* fingerlings fed with 5% diet of WFPL tend to have the highest profit value of 150.00 which was comparable ($P>0.05$) to the *Heteroclarias* fingerlings fed with 10% and 20% of wasted fluted pumpkin leaves having the values of 145.00 and 144.00, while the *Heteroclarias* fingerlings fed with 15% and 0% treatment gave the lowest profit values of 143.00 and 100.00 respectively.

Heteroclarias fingerlings fed with the 5% treatment seemed to have the highest gross profitability value of (33.33%) that was comparable ($P>0.05$) to gross profitability of *Heteroclarias* fingerlings fed with 10%, 20%, 15% and 0% (control) and 15% showing the lowest gross profitability values.

The feed cost efficiency obtained from the *Heteroclarias* fingerlings fed with diet 0% (control) WFPL tended to have the highest feed cost efficiency value of 25.00 which was comparable ($P>0.05$) to the *Heteroclarias* fingerlings fed with diets 20%,15%,10% and 5% having the feed cost efficiency values of 14.44, 14.61, 14.28 and 13.50 respectively.

Table 6: Physiochemical analysis (water quality analysis)

Samples Description	0% (control)	5%	10%	15%	20%	SEM
Temperature ($^{\circ}\text{C}$)	26.00	26.00	26.00	26.00	26.00	0.22
pH	6.54 ^e	6.84 ^e	6.82 ^d	6.86 ^b	6.89 ^a	0.33
Conductivity ($\mu\text{s}/\text{cm}$)	232.00 ^a	127.00 ^e	134.00	172.00	188.00	10.22
DO (mg/l)	4.10	3.10	3.10	4.10	3.10	0.13
BOD (mg/l)	1.10	1.10	1.10	1.20	1.60	0.05

Total Hardness (mg/l)	96.00	48.00	40.00	60.00	68.00	5.18
Alkalinity (mg/l)	110.00	40.00	44.00	56.00	70.00	6.76

NS – Means in the same row with the same superscript are significant different (P<0.05)

SEM – Standard error of mean

Physiochemical Analysis

The *Heteroclarais* fingerlings fed with the WFPL diets tended to have the same temperature range value of 26° C from the control diet to 20% diet.

The *Heteroclarais* fingerlings fed with 20%, 15%, and 5% WFPL seemed to have the highest pH having the values of 6.89, 6.86 and 6.84 respectively, which were comparable (P>0.05) to the pH of the *Heteroclarais* fingerlings fed with 10% and 0% (control) which gave the values of 6.82 and 6.54. Thus, the *Heteroclarais* fingerlings fed with 0% (control) had the lowest pH value of 6.54.

There was significant difference (P<0.05) of the treatment observed on conductivity (µs/cm). *Heteroclarais* fingerlings fed with (control) treatment tended to have the highest value of conductivity of (232.00µs/cm) which was comparable (P<0.05) to the conductivity of water fed with 20% and 15% diets having the values of (188.00µs/cm) and (172.00µs/cm) respectively. The conductivity by *Heteroclarais* fingerlings fed with 10% and 5% WFPL diets were (134.00µs/cm) and (127.00µs/cm), with *Heteroclarais* fingerlings fed with 5% WFPL diet having the lowest conductivity (µs/cm) value of 127.00µs/cm.

There was significant difference (P<0.05) of treatment on the observed Dissolved Oxygen (DO)(Mg/1). The *Heteroclarais* fingerlings fed with (control) and 15% seemed to have the highest D.O values of 4.10mg/1 and 4.10mg/1 which were comparable (P<0.05) to that of 5%, 10% and 20% which gave the values of 3.10mg/1, 3.10mg/1 and 3.10mg/1 are of the same values .

Heteroclarais fingerlings fed with 20% WFPL diet tended to have the highest Biological Oxygen Demand (BOD mg/1) value of (1.60mg/1) that was comparable (P<0.05) to BOD (mg/1) by *Heteroclarais* fingerlings fed with 15%,10%,5% and 0% (control) WFPL with the value of 1.20mg/1, 1.10mg/1, 1.10mg/1 and 1.10mg/1 respectively with diet 0% (control), 5% and 10% showing the lowest BOD (mg/1) values.

There was significant difference of treatment on the Total Hardness (mg/1). The *Heteroclarais* fingerlings fed with 0% (control) diet tend to have the highest total hardness of water with the value of 96.00mg/1 which was comparable (P<0.05) to the total hardness of water by the *Heteroclarais* fingerlings fed with 20% and

15% WFPL diets, *Heteroclaris* fingerlings fed with 5% and 10% WFPL diets showed the lowest total hardness of water values of 48.00mg/1 and 40.00mg/1. There was significant difference ($P < 0.05$) of treatment on the obtained Alkalinity (mg/1). The *Heteroclaris* fingerlings fed with (control) seemed to have the highest value of 110.00mg/1 which was compared ($P < 0.05$) to the alkalinity of 20% and 15% diets which had the values of 70.00mg/1 and 56.00mg/1. The lowest value of alkalinity of water was obtained from *Heteroclaris* fingerlings fed with 10% and 5% treatment with the values of 44.00mg/1 and 40.00mg/1. From the analysis in Table 3, it shows that there was no significant difference ($P > 0.05$) between weight gain and feed conversion ratio (FCR) 5.20%, 4.20%, 3.78%, 2.88% and 1.41% respectively, and there was no significant effect ($P > 0.05$) also between the Specific Growth Rate (SGR) and the Survival Rate (SR) 76.68%, 73.34%, 50.00%, 13.34% and 13.34%.

The use of leaf meal as an ingredient substitute to reduce the cost of fish feed is receiving increasing attention by fish nutritionist around the world (Bairagi *et al.*; 2004). It is, however, important that the selected protein sources do not conflict with human food security interest. The body weight gain value obtained in this experiment from *Heteroclaris* fingerlings on 0% (control) and 15% wasted fluted pumpkin diet was high.

The insignificant difference in the weight gain can be said to be due to the decreasing level of crude protein as the result showing a negative correlation between the weight gain and level of protein inclusion in the diet.

The proximate composition carried out also shows that, the crude protein constituent of the various diet increases as the inclusion level increases with the values of 34.93%, 31.18%, 34.72%, 38.19% and 40.01% respectively, this can be attributed to addition of protein WFPL contributed to the total diets in accordance with (Ajayi *et al.*, 2011).

According to Iweala and Obidoa (2009) a long term feeding of fluted pumpkin (*Telfairia occidentalis*) diet caused a significant increase in weight of rabbits which may be due to its content of rich protein, In this experiment, it reveals that the long term use of treatments also caused a significant increase in weight of *Heteroclaris* fingerlings which may be due to its content of rich protein.

There was a significant difference in the length observed (from 4.55cm to 5.96cm) with a corresponding increase in the

The result of the feed intake was not significant, because the *Heteroclaris* fingerlings had a normal feed intake of 1.50g as the level of wasted fluted pumpkin increased in their feed. This implies that, when alternative food sources such as plant protein are used in fish diets, one of the common problems

encountered is the acceptability of the feed by fish, and this frequently relates to the palatability of the diet (Rodriguez *et al*; 1996). In the present investigation, all the experimental diets were accepted by *Heteroclaris* fingerlings, indicating that the levels of incorporation of wasted fluted pumpkin leaf meal did not affect the palatability of the diets. This might be attributed to the processing technique which involved drying techniques that might have reduced the antinutrient like *Leucaena* leaf meal, thereby increasing its palatability in *clarias gariepinus*. This observation related to the works of Siddhuraju and Becker (2003), Francis *et al*; (2001) and Fagbenro (1999). These workers reported that reduction in antinutrient by different processing techniques reduced in better palatability and growth in fish.

In this study, *Heteroclaris* fingerlings fed 15% inclusion level of WFPL produced the best growth performance of specific growth rate of 0.01%, high survival rate of 76.68%, while the treatment fed with 0% (control) inclusion level of WFPL has the least growth performance, and this is agreement with Onyakeke, (2010) and Issa, (2011) which shows that from 10% to 20% inclusion level of the total diet and is tend to convert feed to meat but above 20% are not recommended.

The physiochemical parameter observed in the process of carrying out the experiment was in tolerable range, therefore temperature and pH has a minimal adverse effect on the growth performance of the fish. The African catfish is an excellent species for aquaculture as it is omnivorous, grows fast, and tolerates relatively poor water quality (Rad *et al*; 2003).

The successful utilization of wasted fluted pumpkin leaves meal as a feed ingredient at the graded level of 15% of the total feed can be compete between man and animals for the available conventional feedstuff which is one of the problem associated with feed ingredient stated by Rad, *et al*; (2003).

Various workers on Tilapia fishes have shown that leaf meal protein at low levels of inclusion (less than 50%) in fish diets were able to support growth (Ritcher *et al*; 2003,. Santiago *et al*; 1988; Afuang *et al*; 2003). The growth performances of fish tend to agree with those of the earlier workers Ritcher *et al*; (2003). Although body weight increases were generally low (Table 3) the condition factors were not significantly different for all the treatments. The low weight gain might be attributed also to the fact that fish were fed exclusively on formulated feeds with low vitamins supplements and no access to natural feed as may be found in pond or riverine conditions. The African catfish is omnivorous and feeds from a wide array of organisms under natural conditions.

Conclusion and recommendation

Conclusion

The results of the experiment show that the wasted fluted pumpkin leaves (WFPL) can be used in the *Heteroclaris* fingerlings diet or nutrition considerably since their growth performance was not significantly affected.

Based on the result from this study, wasted fluted pumpkin leaves (WFPL) reveal that 15% inclusion of FPL in the total diets of *Heteroclarias* fingerlings have the best growth performance and 10% with best survival rate. And this shows that wasted fluted pumpkin leaves can be utilized in the diet of *Heteroclarias* fingerlings, which will reduce competition of conventional feedstuff between man and animals and reduced the wasted of the leaves.

The leaves of *Telfairia occidentalis* have the potential to make considerable contributions to growth of the Africa catfish. It also has the potential to partially reduce feed cost to fish farmer, whose most important production cost comes from feed. This study has demonstrated that, in general, *Telfairia occidentalis* leaves meal could be included from 10% to 20% level in *Heteroclarias* fingerlings diets without any negative effects on the growth. Therefore, the use of *Telfairia occidentalis* leaves meal at the appropriate grade level should always be put into consideration.

The inclusion level of fluted pumpkin leaves to the diets of *Heteroclarias* fingerlings from 15% and 20% is hereby recommended because there was no adverse effect on the performance of *Heteroclarias* fingerlings, having a relatively comparable Feed Conversion Ratio (FCR), Specific Growth Rate (SGR), Protein Intake (PI) etc. with the view of also reducing the cost of feeding.

Higher inclusion levels above 20% should also be further exploited by researchers to see if *Telfairia occidentalis* can further reduce the cost of feeding in an aqua cultural enterprise without altering and even increasing the nutritional status of the fish.

Government should organize workshops, seminars and awareness campaign to sensitize and popularize the use of leaf meals like *Telfairia occidentalis* as an ingredient in the formulation of fish feed among the farmers for easy adoption, with a view of reducing the over dependence on foreign/imported feeds (coppens) which are expensive to the local farmers to come by. Therefore, the utilization of unconventional feedstuff such as wasted fluted pumpkin leaves should be put into consideration.

REFERENCES

- Adeniji, A.A., Chibougwu I.C., Gana E.S., and Sam S.O. 2011. Effects of feeding wasted pumpkin (*Telfaria occidentalis*) on the performance of growing rabbits. International journal of Agricultural and development Economics (IJADE) ISBN:978-978-499988-7-1.p116-119
- Afuang, W., Siddhuranju, P., and Becker, K., 2003. Comparative nutritional evaluation of raw methanol extract residues of moringa (*Moringa oleifera*)

- leaves on growth performance and feed utilization in Nile Tilapia. (*Oreochromis niloticus*) Aquaculture Res. 34: 1147-1157.
- Ajayi, C.T., Oladosu-Ajayi, R.N and Babarinsa, M.K. (2007): Growth performance of *Claris gariepinus* feed *Gmelina arborea* seed meal at different inclusion level of total feed. Department of fisheries Technology, (F.C.F.F.T), New Bussa.
- Association of Analytical chemist (A.O.A.C.). (2002): Official method of Analysis (18th edn.). Heldric. Association of Official Analytical Chemist Virginia. U.S.A. pp1298- 1309.
- Bairagi, A., Sarkar- Ghosh., K.S and Ray, A.K.(2004): Evaluation of the nutritive value of *Leucaena leucocephala* leaf meal, inoculated with fish intestinal bacteria, *Bacillus substilis* and *Bacillus circulans* in formulated diets for diets for rohu, *Labeo rohita* (Hamilton) fingerlings. Aquaculture Research, 35, pp 436- 446.
- Eyo, A.A. (2001): Fish processing Technology in the tropics. A publication of National Institute of Freshwater Fisheries Research (NIFFR). New Bussa, Nigeria pp
- Fagbenro, O.A., (1999); Comparative evaluation of heat processed winged bean (*Psophocarpus tetragonolobus*) meals as partial replacement for fish meal in diets for African (*Clarias gariepinus*). Aquaculture 34: pp170, 297- 305
- Falayi, B.A., (2009): Tropical feedstuffs, composition tables and some biological catalogues in fish and livestock production (A guide in nutrition technology, series 3 pp12- 49 ISBN 978- 48686-6-2). First Edition.
- Food and Agriculture Organization (FAO), (2005); United Nations and Agricultural Organization/ World Health Organization; Fruits and Vegetables for health. Report of a joint FAO/ WHO workshop.
- Francis, G., Makkar, H.P.S. and Becker (2001): Ant nutritional factors present in plant derived alternate fish feed ingredients and their effects in fish. Aquaculture pp197, 199- 227.
- Issa, B.A.R., (2011): Effect of feeding raw roasted and cooked *Gmelina arborea* seed meal on carcass characteristic of cockerel chicks, unpublished National Diploma thesis, Federal college of wildlife Management New Bussa. Pp 14- 16.
- Iwalewa , E.O., Adewumi, C.O., Omisore , N.O.A and Adebajji, O.A (2005): Pro and antioxidant effects and cytoprotective potentials of nine edible vegetables in south west Nigeria. *Nigeria Journal of med. Food 8*: pp539-544.

- Onyakeke, A.A.(2010): Hematological changes observed using varying dietary levels of *Gmelina arborea* seed meal (MASM). Unpublished National Diploma thesis, federal college of Wildlife Management, New BUSSA. Pp15
- Rad, F., Kurt, G.I and Bozaoulu, A.S (2003): Effects of spatially localized and dispersed patterns of feed distribution on the growth, size dispersion and feed conversion ratio of the African catfish (*Clarias gariepinus*)
- Ritcher, N., Siddhuraju, A. and Becker K. (2003): Evaluation of nutritional quality of moringa (*Moringa oleifera*) leaves as alternative protein source for Tilapia (*Oreochromis niloticus* L). Aquaculture Res; 217, 599- 611
- Rodriguez, S.M .Olvera, N.M.A.and Carmona, O.C. (1996): Nutritional value of animal by product meal in practical diets for Nile tilapia (*Oreochromis niloticus* L) fry. Aquaculture Res; 27: 67-73
- Santiago, C.B., Aldaba, M.B., Laron, M.A and Reyes, S.O (1988): Reproductive performances and growth of Nile Tilapia (*Oreochromis niloticus*) brood stock fed diets containing *Leucana leucocephala* leaf meal. Aquaculture Res; 70: 53- 61
- Siddhuraju, P. and Becker, K. (2003): Comparative nutritional evaluation of differentially processed mucuna seeds (*Mucuna pruriens* L.) DC Var.utilis (wall ex weight) Baker ex Burck, on growth performance, feed utilization and body composition in Nile Tilapia (*Oreochromis niloticus*), Aquaculture, 34 :487-500
- Steel, R.G.D and Torries, J.H.(2000): Principles and procedures of statistics. A biometrical Approach. 4th edn. Mc Graw Hill Book Company, New York, USA.