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GROWTH AND NUTRIENTS UTILIZATION OF *CLARIAS GARIEPINUS* FINGERLINGS (BURCHELL, 1822) FED *TELFAIRIA OCCIDENTALIS* LEAF MEAL AS FEED ADDITIVE

[1]Ochokwu, I. J., [1]Umaru, J., [2]Saidu, K.A.

Department of Fisheries and Aquaculture, Faculty of Agriculture and Agricultural Technology, Federal University Dutsin-ma, PMB 5001, Katsina State – Nigeria
Correspondence Email: fineije@gmail.com; phone number +2348060907861

ABSTRACT: *The research was carried out in the farm for 56 days to evaluate the benefits of Telfairia occidentalis additive on growth and nutrients utilization of Clarias gariepinus fingerlings in a Complete Randomized Designed set up. The leaf of T. occidentalis were air dried for two weeks in an indoor facility, and then pounded into powder form. One hundred and thirty five (135) C. gariepinus fingerlings (mean body weight 9.6g) were randomly distributed into fifteen (15) plastic bowls at nine fish/ bowl in triplicates. Five diets designated as D1, D2, D3, D4 and D5, containing 40% crude protein with 0, 50, 100, 150, and 200g/kg of T. occidentalis leaf meal, were included in the basal feed, formulated and fed to Clarias gariepinus fingerlings at 5% body weight per day. The result revealed that T. occidentalis significantly (P≤0.05) improved the growth of Clarias gariepinus fingerlings. The highest mean weight gain (14.6g) was in D2, followed by D3 (10.6g), while control D1 had the least 10.1g. Meanwhile there was significant (P≤0.05) difference in relative growth rate across the diets, diets that was fed with T. occidentalis had the best when compared with D1 respectively. The research demonstrate the efficiency of including leaf meal in the diets of fish. It has proved that leaf is proficient towards improving the well-being, growth, and nutrients absorption in fish. It uncover high survival rate when given to the fish in right proportion.*

KEYWORDS: weight, length, nutrients utilization, clarias gariepinus, telfairia occidentalis leaf

INTRODUCTION

The essentiality of fish feed cannot be over emphasized; it remains a basic need in aquaculture (Ochokwu *et al*., 2014). The quality of the feed is of utmost important for increase in weight, length and nutrients parameters of the fish needed for the increasing population. Ochokwu *et al*. (2016) reported that with expansion in aquaculture, there is a need to improve the quality and nutrient components of feeds consumed by the fish through sourcing for natural and available ingredients which will promote growth and hence nutrients absorption for fish wellbeing.

Generally, African catfish have been accepted in Nigeria and is of commercial importance because of its ability to be hybridized among the genus of Clarias (Ochokwu *et al*., 2016), it has a resistance to diseases and unfavorably temperature, with an ability to grow fast even under intensive rearing

(Ochokwu *et al*., 2019). Catfish farming accounts for 85% total aquaculture production in Nigeria (Bolorunduro, 2016), though it is omnivorous in nature yet can consume, convert and utilize pellet feed for growth. There are other methods used to improve growth and quality of African catfish; it can be through genetic manipulations (Omeji *et al.,* 2013), Hybridization and selective breeding (Ochokwu *et al*., 2016), However in selective breeding it could be either qualitative or quantitative traits and also through improved varieties of feed.

Fish feed has been a significant concern in Aquaculture development in Nigeria. Most farmers have utilized the pelleted feeds yet the growth rate of the fish have not significantly improved as anticipated by the farmers, the growth of the fish is connected to its wellbeing (condition factor), ability of the fish to convert the feed for energy and growth. Most fishes consume the feed but few convert it for growth. Therefore there is a need to source for other ingredients which can be added to the fish feed to enhance feed conversion for higher growth. Every farmer expect an increase and better yield, hence poor growth, yield and output will retard aquaculture propagation.

However the need for excellent feed and high rate of fish consumption among the people as a cheap source of protein (Sanda *et al*., 2015) has necessitated the research. The research centered on improving the growth of the fish using available ingredients, including *T. occidentalis* which is available all year round. Some of the plants, leaf and nuts which have not been used are now effectively incorporated into fish feeds either as additives, inclusions, supplements, partial or total replacement is now utilized for catfish (Onyia *et al*., 2015). In recent time Dada and Ajilore (2009) included *Garcinia kola* seed into fish feed to enhance the growth in *Clarias gariepinus*, also in 2010, Adeprausi utilized *Kigelia Africana* fruit meal as a growth enhancer in male and female of *C. gariepinus* (Adeparusi *et al*, 2010), Ochokwu *et al.* (2014) used *Azanza garckeana* pulp meal to increase the growth of *Clarias gariepinus* broodstock, Udoh *et al*. (2017) used bitter leaf meal, and Amisah *et al*., (2009) used *Leucaena leucocephala* leaf meal to improve growth in *Clarias gariepinus*, meanwhile other researchers has also used leaf as feed additives to enhance growth in *Clarias gariepinus* and *Oreochromis niloticus*; *Astragalus radix* and *Scutellaria radix* (Yin *et al*., 2006); *Allium sativum* (Sahu *et al*., 2007); Mango leaf meal (Awad and Austin, 2010) and *Nigella sativa* (Awad *et al*., 2013). These plants have been used as antibiotic, growth promoters and immune-stimulants.

Telfairia occidentalis popularly called Ugu in Nigeria, is a vegetable, generally accepted, cultivated and consumed in all parts of Nigeria as vegetable and herbal medicine. It is rich in nutrients such as protein, oil, vitamins and minerals. It is a rich source of phytochemicals and folic acid (Dada *et al*., 2015). *Telfairia occidentalis* is rich in bioflavonoid, an active chemical that stimulate growth in animal. The major important of *Telfairia occidentalis* leaf is its availability all year round. It can be cultivated during raining season and also in dry season using irrigation method or around the bank of a river, dam and lake. The aim of the research is to ascertain the growth parameters and nutrients utilization of *C. gariepinus* fed *Telfairia occidentalis* additives.
There is paucity of information on the use *Telfairia occidentalis* leaf meal as a supplement in the diet of *C. gariepinus* fingerlings, hence this research was designed to ascertain the growth and nutrients utilization of *C. gariepinus* fingerlings fed diet supplemented with *Telfairia occidentalis* leaf meal.

MATERIALS AND METHODS

The experiment was carried out in Teaching and Research Farm Department of Fisheries and Aquaculture Ebonyi State University, Abakaliki. Ebonyi state is located on latitude 6º 18' 58" (6º 18' 97) North of the Equator and longitude 8º 7' 0" (8º 7' 1) E and an altitude of 123m. It has an average annual rain fall of about 1613.8mm to 2136.27mm with maximum temperature of 27º to 30^0C. The rainy season run from April through October, while the dry season commences November and ends in March. The driest months of the year are January and February when the relative humidity drops to 13% (Diagi and Weli, 2017).

Source and preparation of *Telfairia occidentalis*

Telfairia occidentalis leaf was purchased from the major market popularly known as Eke aba and also from meat market in Ebonyi State - Nigeria. *Telfairia occidentalis leaf* shown in Plate I was air dried under room temperature for two weeks. The dried *T. occidentalis* was pounded into powdered form using mortar and pistol and sieved using sieve material of Bs 0.8mm mesh size to obtain fine particles for homogenous mixing as shown in plate II. The leaf meal powder was used to analyze for nutrient composition, phytochemical and mineral elements according to (AOAC, 2012). 0, 50, 100, 150, 200g/kg of *T. occidentalis* was weighed and mix with basal feed to contain 40% crude protein based on the formulation defined for African *Catfish* (*C. gariepinus*) according to (Onyia *et al.*, 2015).

Plate I: *T. occidentalis* fresh leaf

Plate II: *T. occidentalis* leaf meal in powdered form

Experimental Diet

The experimental diets (Table 1), contained 40% crude protein using the Pearson square method. Fish meal, soybean bean meal, groundnut cake meal, yellow maize, vitamin premix, cassava starch (binder), palm oil, sodium chloride was procured from meat market in Abakaiki. Soybean was toasted for 10 minutes using a fabricated manual soybean roaster at 100°C. Fish meal, toasted soybean, groundnut cake and yellow maize were grounded separately using hammer miller. All the feed ingredients were weighed with an electric weighing balance (Model: Metler Toledo PB 8001, London). The feeds ingredients were thoroughly dry mixed manually and pelleted, the pellets were packed in a bag until required.

Table 1: Formulation of the Experimental Diets (g) on Dry Matter Bases

Ingredients	D1 (control)	D2	D3	D4	D5
Fish meal	350	350	350	350	350
Soya bean meal	200	200	200	200	200
Groundnut cake	200	200	200	200	200
Yellow maize	150	150	150	150	150
Palm oil	20	20	20	20	20
Vitamin premix	20	20	20	20	20
Binder (starch)	50	50	50	50	50
Sodium chloride	10	10	10	10	10
T. occidentalis leaf meal (g)	0	50	100	150	200
%) *T. occidentalis* leaf meal	0%	5%	10%	15%	20%

Experimental Design

Complete Randomized Design (CRD) was used in setting up the experiment. One hundred and thirty five (135) *C. gariepinus* fingerlings were acclimatized for 48 hours and stocked per troughs for 5 different plastic troughs of 120 liters volume with three replications per treatment. Five isonitrogenous diets (D1, D2, D3, D4 and D5) were formulated from practical ingredients. The control (D1) basal diet were without *T. occidentalis* leaf meal and the others were included with 50g, 100g, 150g, and 200g/kg of *T. occidentalis* respectively. The experimental diets were formulated to contain 40% crude protein. All dietary ingredients were weighed with a weighing load balance (Metler Toledo PB 8001 London). Ingredients such as vitamin premix were mixed with *T. Occidentalis* meal thoroughly to obtain a homogenous mass before mixing with other ingredients and pelletized. The pellet was sundried, packed in a sack until the commencement of the experiment. The experimental diets were assigned randomly to the tanks and each group of fish was fed at 5% body weight twice per day for 56 days. Every week, all the fish were batch-weighed to determine the weight and length increase and to calculate the feed consumption.
The following growth parameters were calculated:

Weight gain (g) = Final weight – Initial weight
Length gain (cm) = Final length – Initial length

$$\text{Condition factor (K)} = \frac{100 \text{ x final weight}}{L^3}$$

Where L^3 = length (cm)

$$\text{Relative Growth Rate (RGR)} = \frac{\log \text{final weight} - \log \text{initial weight}}{\text{no of days}}$$

$$\text{Specific Growth Rate (SGR)} = \frac{\log \text{final weight} - \log \text{initial weight x } 100}{\text{no of days}}$$

Feed intake = weight of fish x feed rate (5%) x number of fish stocked/bowl

$$\text{Mean Feed Intake (MFI)} = \text{Total feed consumed}$$

$$\text{Protein Intake (PI)} = \text{Quantity of feed consumed x Crude protein}$$

$$\text{Protein Efficiency Rate (PER)} = \frac{\text{weight gain}}{\text{Protein intake}}$$

$$\text{Feed conversion Ratio (FCR)} = \frac{\text{Feed intake}}{\text{Weight gain}}$$

$$\text{Survival rate (\%)} = \frac{\text{final number of fry}}{\text{initial number of fry}} \text{x } 100$$

Survival rate

$$\text{\% Survival} = \frac{\text{Number of stocked fingerlings}}{\text{Total number of fingerlings after 56 days}} \text{ x } 100$$

Statistical Analysis

Data collected was analyzed statistically using analysis of variance (ANOVA) in Generalized Linear Model (GLM) procedure of SAS (Statistical Analysis System) version 8, 1999; Means were separated using Duncan Multiple Range Test (DMRT).

RESULTS

Table 2 shows the Proximate and mineral composition of *T. occidentalis* Leaf meal. The leaf meal contains most of the nutrients required for fish growth. Moisture content 8.5%, crude protein 24.39%, fat 3.20%, crude fiber 14.33%, ash 7.21%, and Nitrogen free extract 34.37% respectively. The mineral compositions analyzed are sodium 68.72mg/l, calcium 52.32mg/l, iron 18.99mg/l, magnesium 43.9mg/l, potassium 257.0mg/l and zinc 17.5mg/l respectively.

Table 3 present the phytochemical composition of *T. occidentalis* leaf meal. It was found to contain Tannins 1.16, saponins 2.28, Alkoloids 1.80, flavonoids 2.65, phenols 0.91.

Table 2: Nutrient Composition and % Dry Matter Basis of *T. occidentalis* leaf Meal

Nutrient and Mineral Compositions	Values
Moisture Content	8.5%
Crude Protein	24.39%
Fat	3.20%
Crude Fiber	14.33%
Ash	7.21%
Nitrogen Free Extract	34.37%
Sodium	68.72 mg/l
Calcium	52.32 mg/l
Iron	18.99 mg/l
Magnesium	43.9 mg/l
Potassium	257.0 mg/l
Zinc	17.5 mg/l

Table 3 Phytochemical Composition of *T. occidentalis* Leaf Meal

Phytochemical Composition	%
Tannins	1.16
Saponins	2.28
Alkoloids	1.80
Flavonoids	2.65
Phenols	0.91

Table 4 shows the proximate composition of formulated feeds with varying inclusion levels of *T. occidentalis* leaf meal. The crude protein for diet 1 to diet 5 ranged from 39.79 in diet 5 to 40.60 in diet 3, crude lipid ranged from 18.80 in diet 5 to 26.01 in diet 1, meanwhile the crude fiber content ranged from 1.43 in diet 1 to 4.77 in diet 5, while moisture content was 5.33 in diet 1 to 8.83 in diet 5, ash ranged from 8.28 in diet 1 to 10.13 in diet 5, while nitrogen free extract ranged from 17.14 in diet 3 to 19.02 in diet 4 respectively.

Table 5 represents the water quality parameters. The temperature for all the diets ranged from 26.70 to 29.45, however the dissolved oxygen recorded was 4.35 to 5.10 and pH was 6.70 to 7.10 respectively.The effects of different levels of *T. occidentalis* on the weight changes of *C. gariepinus* fingerlings fed for 56 days are presented in table 6. The mean weight for control ranged from 8.8 g in week 0 to 19.7g in week 8, 5% *T. occidentalis* inclusion ranged from 10.6g in week 0 to 24.2g in week 8, 10% *T. occidentalis* ranged from 8.9g in week 0 to 20.2g in week 8, 15% ranged from 10.9g in week 0 to 20.1g in week 8 while the 20% *T. occidentalis* ranged from 10.9g in week 0 to 20.5 in week 8 with the 5% *T. occidentalis* inclusion having the highest weight gain. Table 7 shows the effects of different inclusion levels of *T. occidentalis* on the length changes of *C. gariepinus* fingerlings. The highest length gain were recorded in 5% and 15% *T. occidentalis* inclusion ranging from week 0 (11.9) to week 8 (15.8cm) in diet 2 and 12.2 in week 0 to 15.4cm in week 8 in diet 4, while treatment with 10% *T. occidentalis* ranged from 12.1 in week 0 to 14.6 cm in week 8, and control ranged from 12.3 in week 0 to 15.4 in week 8, while the least length

gain were recorded in 20% *T. occidentalis* inclusion ranging from 11.8 in week 0 to 13.1cm in week 8 in diet 5 respectively.

The feed intake of *C. gariepinus* fingerlings fed varying inclusion levels of *T. occidentalis* are presented in Table 8. There was no significant difference in the feed intake between control and diet with 10% *T. occidentalis* inclusion which ranged from 0.44 in week 0 to 0.99g in week 8 (diet 0) and 0.45 in week 0 to 1.01g in week 8 (diet 3), while diet with 5%, 15%, and 20% *T. occidentalis* have no significant difference and ranged from 0.53 to 1.21 in diet 2, 0.55 to 1.00 (diet 3) and 0.55 to 1.03 in diet 5 respectively.

Table 4 Proximate Composition of Experimental Diet

	Dietary Treatments				
Nutrients %	D1	D2	D3	D4	D5
Crude protein	40.23	40.15	40.60	40.13	39.79
Crude lipid	26.01	25.08	22.24	19.00	18.80
Crude fiber	1.43	2.13	3.24	3.81	4.77
Moisture content	5.33	6.35	7.20	8.13	8.83
Ash	8.28	9.12	9.58	9.91	10.13
Nitrogen Free Extract	18.72	17.17	17.14	19.02	17.68

Table 5 Water quality parameters during the experimental period

Parameters	**Minimum**	**Maximum**
Temperature (^{0}C)	26.70	29.45
Dissolved oxygen (mg/l)	4.35	5.10
pH	6.70	7.10

Table 6 Weekly weights (g) of *C. gariepinus* fingerlings fed with experimental diets

Week	D1	D2	D3	D4	D5
0	9.6^{a}	9.6^{a}	9.6^{a}	9.6^{a}	9.6^{a}
1	10.8^{b}	13.0^{e}	10.8^{a}	13.2^{d}	12.1^{c}
2	11.9^{b}	17.2^{e}	11.5^{a}	14.9^{c}	15.2^{d}
3	13.1^{a}	18.3^{e}	13.3^{b}	16.7^{c}	17.4^{d}
4	16.2^{b}	20.7^{e}	14.6^{a}	17.4^{c}	18.2^{d}
5	17.7^{b}	22.2^{e}	15.8^{a}	18.2^{c}	18.8^{d}
6	17.8^{b}	23.0^{e}	17.2^{a}	18.9^{c}	19.2^{d}
7	18.8^{a}	23.3^{e}	19.4^{c}	19.2^{b}	19.8^{d}
8	19.7^{a}	24.2^{d}	20.2^{b}	20.1^{b}	20.5^{c}

Means with different superscripts on the same row are significantly different ($P \leq 0.05$)

Table 7 Weekly lengths (cm) of *C. gariepinus* fingerlings fed with experimental diets

Week	D1		D2		D3		D4		D5	
	TL	SL	TL	SL	TL	SL	TL	SL	TL	SL
0	12.3^{c}	10.7^{b}	11.9^{a}	10.2a	12.1^{b}	10.9^{c}	12.2^{b}	10.1^{a}	11.8^{a}	10.2^{a}
1	12.4^{ab}	10.8^{b}	13.5^{c}	12.0	12.4^{ab}	10.9^{b}	12.3^{a}	10.4^{a}	12.5^{b}	10.8^{b}
2	12.4^{a}	11.2^{ab}	14.4^{d}	12.8^{c}	13.0^{b}	11.1^{a}	13.2^{c}	11.3^{b}	13.1^{bc}	11.3^{b}
3	13.1^{a}	11.5^{a}	14.7^{d}	12.9^{d}	13.4^{b}	12.1^{b}	13.5^{b}	12.1^{b}	13.8^{c}	12.5^{c}
4	13.7^{a}	12.4^{b}	15.2^{d}	13.5^{d}	13.5^{a}	12.1^{a}	13.9^{b}	12.7^{c}	14.2^{c}	12.5^{b}
5	14.4^{b}	13.0^{c}	15.3^{d}	14.1^{d}	13.9^{a}	12.5^{a}	14.0^{a}	12.7^{b}	14.8^{c}	12.7^{b}
6	14.5^{a}	13.2^{c}	15.4^{a}	14.4^{d}	14.0^{a}	12.5^{a}	14.3^{a}	12.8^{b}	14.9^{a}	12.7^{b}
7	15.3^{d}	13.5^{c}	15.5^{e}	14.4^{d}	14.1^{a}	12.6^{a}	14.8^{b}	12.9^{b}	15.1^{c}	12.8^{b}
8	15.4^{ab}	13.7^{a}	15.8^{c}	14.6^{a}	14.6^{a}	12.7^{a}	15.4^{b}	12.9^{a}	15.4^{b}	13.1^{a}

Means with different superscripts on the same row are significantly different (P≤0.05)
TL - Total Length, SL - Standard Length

Table 8: Weekly Feed Intake (g) *C. gariepinus* fingerlings fed with experimental diets

Week	D1	D2	D3	D4	D5
0	0.48^{a}	0.48^{a}	0.48^{a}	0.48^{a}	0.48^{a}
1	0.54^{b}	0.65^{a}	0.54^{b}	0.66^{a}	0.61^{a}
2	0.60^{b}	0.86^{a}	0.58^{b}	0.75^{b}	0.76^{b}
3	0.66^{c}	0.92^{a}	0.67^{c}	0.84^{b}	0.87^{b}
4	0.81^{b}	1.04^{a}	0.73^{c}	0.87^{b}	0.91^{a}
5	0.89^{b}	1.11^{a}	0.79^{c}	0.91^{b}	0.94^{b}
6	0.89^{a}	1.15^{a}	0.86^{a}	0.95^{b}	0.96^{b}
7	0.94^{b}	1.17^{a}	0.97^{b}	0.96^{b}	0.99^{b}
8	0.99^{c}	1.21^{a}	1.01^{b}	1.00^{b}	1.03^{b}

Means with different superscripts on the same row are significantly different (P≤0.05)

Table 9 showed the effects of different inclusion levels of *T. occidentalis* on growth parameters of *C. gariepinus* fingerlings fed for 56 days. The results showed that there was significant different in the feed intake which ranged from 6.74g in diet 0 to 8.69g in diet 2 respectively. In feed conversion rate, 15% and 20% *T. occidentalis* inclusion had the highest 0.71 in diet 4 and 0.70 in diet 5. There was no significant difference (P≤0.05) in the Specific growth rate of the fish fed with all diets which ranged from control 0.55 in diet 1 to 0.71 in diet 2. In Relative growth rate it ranged from 1.27 in diet 1 to 0.33 in diet 5 respectively. Protein efficiency rate ranged from 0.033in diet 5 to 0.042 in diet 2 respectively, while the condition factors ranged from 0.540 in diet 1 to 0.912 in diet 5 respectively.

Table 9: Growth Performance and nutrients Utilization of *Clarias gariepinus* fingerlings fed experimental diets

	D1(control) 0%	D2 5% 5%	D3 10%	D4 15%	D5 20%
Mean initial weight (g)	9.6^{a}	9.6^{a}	9.6^{a}	9.6^{a}	9.6^{a}
Mean final weight g)	19.7^{c}	24.2^{a}	20.2^{b}	20.1^{b}	20.5^{b}
Mean weight gain (g)	10.1^{b}	14.6^{a}	10.6^{b}	10.5^{b}	10.9^{b}
Mean final length (cm)	15.4^{a}	15.8^{a}	14.6^{b}	15.4^{a}	13.1^{c}
Mean initial length (cm)	12.3^{a}	11.9^{b}	12.1^{a}	12.2^{a}	11.8^{b}
Mean length gain (cm)	3.1^{b}	3.9^{a}	2.5^{c}	3.2^{b}	1.3^{d}
Mean feed intake(g)/fish	6.74^{c}	8.69^{a}	6.55^{c}	7.49^{b}	7.62^{b}
Feed conversion ratio	0.67^{b}	0.60^{b}	0.62^{b}	0.71^{a}	0.70^{a}
Relative growth Rate(%/ fish)	1.27^{a}	0.40^{b}	0.33^{b}	0.32^{b}	0.33^{b}
Specific Growth Rate(%/ fish)	0.55^{b}	0.71^{a}	0.59^{b}	0.57^{b}	0.59^{b}
Protein intake	271.15^{c}	348.90^{a}	265.93^{d}	300.57^{b}	303.20^{b}
Protein efficiency rate	0.037^{b}	0.042^{a}	0.040^{a}	0.035^{b}	0.033^{bc}
Condition factor (K)	0.540^{c}	0.614^{bc}	0.649^{b}	0.550^{c}	0.912^{a}
% Survival rate	83.33^{b}	100^{a}	100^{a}	100^{a}	83.33^{b}

Means with different superscripts on the same row are significantly different ($P \leq 0.05$)

DISCUSSION

The result revealed the efficacy of dietary *T. occidentalis* leaf meal. It had significant ($P \leq 0.05$) effects on the growth performance of *C. gariepinus* fingerlings. The proximate, mineral and phytochemical values of *T. occidentalis* agreed with the findings of (Akwukwaegbu *et al*., 2016; Mohd *et al*., 2016) who obtained similar range of proximate, phytochemical and mineral composition on *T. occidentalis* leaf meal.

Phytochemical composition of *T. occidentalis* is capable of increasing maximum yield in fingerlings production. Newbrey *et al*. (2011) reported that Caroteniods can be important antioxidant and immune stimulant for developing embryos. Meanwhile Flavonoid is natural biological response, it has a strong inherent ability to modify the body reaction to allergen, virus and carcinogens (Egharevba *et al.*, 2010). It inhibit platelets aggregation and could exert a membrane stabilizing action that may protect liver from injury (Formica *et al.*, 2009). Saponin is of great importance in medicine and used in hyper-cholesterolaemia, hyperglycaemia, antioxidant, anti-cancer, anti-inflammatory and body loss. Phenol and phenolic compounds are anti-microbial agents hence it is extensively used in disinfections and remain the standard with which other bactericides are compared (Okwu, 2006).Tannins has biological activities that are of benefit in the production and management of many aliments owing to their antiviral, antibacterial and anti-tumor activities (Egharevba *et al.,* 2010). Proximate composition of the formulated feeds given to *C. gariepinus* in the experimental diet agrees with the findings of Craig *et al.,* (2002) who stated that prepared or artificial diets may either be complete or supplemental hence it supplied all the

ingredients necessary for optimal growth and health of the fish. Most fish farmers use complete diets those containing all the required nutrients but yet the growth rate is not encouraging.

Growth performance of *C. gariepinus* fed varying inclusion levels of *T. occidentalis* leaf meal showed that there was increase in the growth of the fish at the end of the feeding trial. Statistically there was significant difference in the weight gain at $p \leq 0.05$; the diet fed with *T. occidentalis* revealed a significant increase in weight gain, specific growth rate, mean feed intake, relative growth rate and protein intake than the control that have 0% *T. occidentalis*, this observation was also reported by (Dada *et al*., 2015 and Adeparusi *et al*., 2010). The reason for variations in growth performance of diets fed *T. occidentalis* leaf meal could be attributed to fiber content in *T. occidentalis* leaf meal (14.33%) fiber aid in feed digestion and more reason 5% inclusion had the best in relative growth rate, this implies that the fish was able to utilize and convert the feed for growth, this agree with (Echioda *et al*. 2018; Akwukwaegbu *et al*. 2016 and Bilguven and Baris, 2011). Bilguven and Baris, (2011) reported an observations in effects of the feeds containing different plant protein sources on growth performance and body composition of rainbow trout (*Oncorhynchus mykiss*), the authors reported that differences in soya bean meal, sunflower meal, canola and cotton seed meal can be attributed to high level of complex carbohydrate and high level of crude fiber content in canola and cotton seed meal. However Amisa *et al*. (2009) observed higher growth performance in the African catfish fed varying inclusion levels of *Leucaena leucocephala* leaf meal and also reported that there was no significant difference ($p>0.05$) in the initial body weight, final body weight, mean weight gain, feed conversion ratio and specific growth rate even though 20% inclusion gave a better weight gain. These results have a direct link with the nutrients quality of the feeds, palatability and acceptance of the feeds and the feed intake.

The increase in the growth performance of *C. gariepinus* fingerlings agreed to the fact that leaf meal; wild fruits have potentials in enhancing growth in African catfish (Ochokwu *et al*., 2014). However there is a need to ascertain the genetic makeup, the quality of the parent stock used for the propagation. The feed is essential in growth of the fish, however the parent stock used should be carefully selected, hybridized to get a better hybrids. When an improved hybrids is given a quality feed it will give an improved yield, hence greater output.

CONCLUSION

Based on the results obtained in this study, it could be established that *T. occidentalis* is very rich in digestible fiber, protein, phytochemical, minerals and its inclusion in the diet of *C. gariepinus* significantly improved the growth performance of the fish ($P<0.05$), but when above 20% in the diets of *C. gariepinus* it can reduce the growth performance of the fish. It also improved the nutrients, growth parameters and feed utilization of the fish. The growth parameters of *C. gariepinus* fingerlings shown in Table 2 reveled significant increase in the weight and length of the fish. *Clarias gariepinus* fed with 5% inclusion of *Telfairia occidentalis* had higher values in weight (24.2g), length (15.8cm and 14.6cm), Relative growth rate (128.30), Specific growth rate (1.40), and survival rate (100%) respectively.

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