Impact of *Moringa oleifera*, *Lannea barteri* and Oxytetracycline on the Body Composition of *Clarias gariepinus* Fingerlings

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Abstract
An eight (8) weeks experimental feeding trial was conducted on the impact of plant additives and antibiotic on the carcass composition of *Clarias gariepinus* fingerlings. Five hundred and forty (540) fingerlings were randomly distributed into twenty seven re-circulatory tanks in triplicates representing nine dietary treatments. The diets comprised of Additive Diet (AD); Moringa-Whole (ML), Moringa-Aqueous (MA), Moringa-Ethanol (ME), Lannea-Whole (LW), Lannea-Aqueous (LA), Lannea-Ethanol (LE), Antibiotic (ATB) and a commercial reference diet (CRD) as control diet. The fish were fed twice daily while water quality parameters were monitored weekly. The results showed that, the carcass composition of the initial based diets (50.30%) and that of Antibiotic (ATB) based diets (50.31%) were not significantly different (P>0.05) while crude protein of all plant additive based diets fed fish carcasses were significantly higher (P<0.05) than the initial-based fed fish carcass. There were no significant differences (P>0.05) between ether extract of the initial (24.69%) and CRD (24.27%), LW (24.33%), LA (24.17%) and LE (24.10%) respectively. The ashes of all the carcasses of fish fed the experimental diets were not significantly different (P>0.05) from those of the initial. It was concluded that, plants additives in the diet of *Clarias gariepinus* fingerlings can enhance carcass compositions.

Keywords: *Moringa oleifera*, *Lannea barteri*, antibiotics, *Clarias gariepinus*.

Introduction

In aquaculture, the composition of fish carcass is a very good indicator of the physiological condition of the fish (Anyanwu *et al.*, 2015). The chemical composition of fish carcass comprises moisture content, ether extract, crude protein content and ash contents while carbohydrates and non-protein compounds are present in negligible amounts and are usually ignored during routine analysis (Anyanwu *et al.*, 2015). Feeds and feeding are among the major factors influencing carcass composition and fish quality. Shim *et al.* (2009), stated that, fish is a source of high-quality protein, vitamin D, selenium, omega-3 fatty acids and other nutrients. Consumers demand for fish products is increasing rapidly while wild fish stocks are rapidly declining, mainly because of over-fishing (FAO, 2007).

Therefore, this experiment investigated the effects of some selected plant additives on the carcass composition *Clarias gariepinus* fingerlings.

Materials and Methods

The experiment was conducted at Department of Water Resources, Aquaculture and Fisheries Technology, Federal University of Technology, Minna, Niger State, Nigeria. The Departmental recycling tanks and laboratory were used throughout the experimental period.

Fifty grams (50g) each, of *Moringa oleifera* leaf powder and *Lannea bateri* bark powder were measured and soaked in 500ml of ethanol after Nwerze and Nwafor (2014), for 72hours in 1000ml bottle. The bottles were tightly covered to prevent evaporation of the ethanol. The bottles were thoroughly agitated at intervals. The liquids were then doubled filtered using muslin cloth and then, the concentrated liquids were fed to 1litre flask and clipped to a rotary evaporator (Yamato RE300) rotating on a water bath filled to a capacity with water which boiled steadily at 100°C after which the ethanol solvent was separated from the extract. The extracts were then poured into 100ml bottles and exposed to air until ethanol solvent finally dried off. The bottles were labelled as ethanol extracts, covered and preserved in a deep freezer at 4°C prior to the commencement of the experiment. Aqueous Extraction method was equally done to the two plants using water following same procedures of the ethanol extraction. A commercial Reference Diet (CRD) was purchased from a veterinary shop along Kure Market Road, Minna Niger State.

Diet Formulation

Seven diets were formulated for the experiment. Each Diet was formulated to contain 45% Crude Protein in conformity with the control diet. The proximate analyses of the major ingredients as well as, the formulated diets were determined using AOAC (2000) procedures (Table 1). The ingredients were; Maize meal, Fishmeal, Vitamin and Mineral Premix, Vegetable Oil, plant Additives (Moringa and Lannea) and Antibiotic Additive. Vegetable oil, plant additives and antibiotic additive were included in the diets at 2% while 3% of vitamin premix was included in all the tested diets. The ingredients were measured each according to the formulation and thoroughly mixed to ensure homogeneity. The additives were dissolved in 300ml of warm water which was adequate to make a kilogram of dough (for the treatment diets). The dough was fed to a manual pelleting machine using 2mm die. The pellets were oven-dried for two days at 60°C. The dried pellets were then broken into smaller particles to suit the fish.

able 1: Diets Formulated and their Chemical Compositions

Feed Ingredients (g)	Diet 1 (CRD)	Diet 2 (MW)	Diet 3 (MA)	Diet 4 (ME)	Diet 5 (LW)	Diet 6 (LA)	Diet 7 (LE)	Diet 8 (ATB)
FM (72.4% CP)	-	49.40	49.40	49.40	49.40	49.40	49.40	49.40
MM (14.0% CP)	-	43.60	43.60	43.30	43.60	43.60	43.60	43.60
VMP	-	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Vegetable Oil	-	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Additive	-	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Total	-	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Moisture	4.12	2.48	2.84	2.22	2.55	2.82	2.38	2.41
Crude Protein	46.6	44.86	44.89	44.10	44.50	44.50	44.75	45.43
Ether Extract	6.00	8.80	9.70	9.00	8.40	9.90	9.20	9.30
Crude Fibre	2.86	2.60	2.67	2.58	2.40	2.67	2.58	2.58
Ash	17.40	18.60	17.01	15.57	17.40	16.80	13.58	14.90
NFE	23.02	22.66	22.89	26.30	24.75	23.25	27.51	25.38
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

CRD = Commercial Reference Diet, ML=Moringa Whole, MA = Moringa Aqueous, ME = Moringa Ethanol, LW = Lannea Whole, LA = Lannea Aqueous, LE = Lannea Ethanol, FM = Fish meal, MM = Maize Meal, VMP = Vitamin and Mineral Premix and CP = Crude Protein

Experimental Procedures

Four hundred and eighty (480) *Clarias gariepinus* fingerlings of an average wight of 4.60g were acclimated for two weeks at Water Resources, Aquaculture and Fisheries (WAFT) Departmental recycling tanks. During acclimation, they were fed commercial diet (Coppens) at 5% of their body weight (Adedeji and Adegbile, 2011). At the commencement of the experiment, twenty fishes were randomly distributed into 24 recycling plastic tanks of 50litres capacity filled with 30litres of water in well labeled triplicates. The fish were fed test diet at 5% of their body weight twice daily (10.00 and 16.00 hours) and adjusted fortnightly to meet their nutrients requirement for a period of 56days. Water quality parameters were measured weekly (Table 2). Temperature and dissolved oxygen were measured using mercury-bulb thermometer and a hand held Dissolved Oxygen meter (AMAZON AZ8403) respectively. The pH was measured using pocket size pH meter (HANNA HI96107) while total conductivity was measured using pen type digital conductivity meter (SHENZHEN KEDIDA CT-3030). The total alkalinity was determined in the laboratory following the method of APHA (1992).

Proximate Analysis

Tt the end of the experiment, fish was pool together from each treatment. The fish were oven-dried at 60°C for 24hours and the proximate compositions were determined according to AOAC (2010) for the fish carcasses. The analysis were for; Crude Protein, Ether Extract, Ash and Moisture contents. Similar procedure was performed before the commencement of the experiment for the pre-treated fish as initial body composition.

Statistical Analysis

Carcass and digestibility results were subjected to One-way Analysis of Variance (ANOVA) using $P< 0.05$ significance level to test for significant difference. The parameters of mean comparison were applied according to Duncan Multiple Range Test (1955). All data were analysed using Minitab (version 9.2) packages.

Result and Discussions

Findings show that, the carcass compositions of the fish fed with the experimental diets were significantly different ($P<0.05$) from that of initial fish carcass (Table 2). The difference may be as result of effective utilization of plant additives-based diets by the fish which may have improved the immunity while the fish of antibiotic-based diet was not significantly different ($P>0.05$) from the initial based diet, and the fish may have been affected as result of the residual effect of the presence of antibiotic in the diet throughout the experimental period which may have contributed to reducing the fish immunity. This was in line with the report of Sotolu and Faturoti (2009); Alegbeleye (2005), that, in *Heteroclarias* carcass, higher values of protein and crude fats in fish carcasses than initial fish carcass after being fed varying inclusion rates of Bambara groundnut. Ether extracts in this study showed variations which were contrary to that of other authors and may be attributed to the plants additive and antibiotic used.

Table 2: Proximate Composition of Experimental Diets

Compositions (%)	Initial	T1 (CRD)	T2 (NA)	T3 (ML)	T4 (MA)	T5 (ME)	T6 (LW)	T7 (LA)	T8 (LE)	T9 (ATB)
Crude protein	50.30^{d} ± 0.61	55.66^{a} ± 0.29	54.590^{ab} ± 0.01	51.22^{c} ± 0.01	52.31^{bc} ± 0.01	53.31^{b} ±0.01	51.33^{c} ± 0.01	51.22^{c} ± 0.01	55.77^{a} ± 0.01	50.31^{d} ± 0.02
Ether Extract	24.69^{bc} ± 0.01	24.27^{bc} ± 0.01	17.70^{c} ± 0.01	17.20^{c} ± 0.01	25.47^{b} ± 0.01	31.17^{ab} ± 0.01	24.33^{bc} ± 0.01	24.17^{bc} ± 0.01	24.10^{bc} ± 0.01	33.37^{a} ± 0.01
Ash	2.16^{a} ± 0.01	2.17^{a} ± 0.01	1.45^{ab} ± 0.01	2.13^{a} ± 0.01	2.15^{a} ± 0.01	2.15^{a} ± 0.01	1.53^{ab} ± 0.01	2.21^{a} ± 0.06	2.67^{a} ± 0.01	1.03^{ab} ± 0.01
NFE	18.82^{b} ± 0.01	14.85^{c} ± 0.01	22.91^{b} ± 0.01	26.41^{a} ± 0.01	17.11^{bc} ± 0.01	10.68^{d} ± 0.01	19.45^{ab} ±0.01	19.00^{ab} ± 0.01	14.34^{c} ± 0.01	12.02^{cd} ± 0.01
Moisture	3.77^{a} ± 0.01	3.25^{a} ± 0.01	3.39^{a} ± 0.01	3.03^{a} ± 0.01	2.97^{ab} ± 0.01	2.68^{ab} ± 0.01	3.37^{a} ± 0.01	3.41^{a} ± 0.01	3.13^{a} ± 0.01	3.28^{a} ±0.01
Gross energy Kcal/g	497.39^{d} ± 0.01	499.78^{c} ± 0.01	469.22^{de} ± 0.01	465.28^{e} ± 0.01	506.94^{b} ± 0.01	536.52^{ab} ± 0.01	502.04^{bc} ± 0.01	498.41^{cd} ± 0.01	497.62^{d} ± 0.01	549.62^{a} ± 0.01

The inclusion of plant additive in fish diets in this research might have aided the palatability and acceptability by the experimental fish. This was in line with the report of Manaf *et al.* (2016), whose findings showed that, plants crude extracts improved feed utilization of fish and reduced diseases by regulating pathogens in the gastrointestinal tract. However, the moisture contents were not significantly different (P>0.05) in the treatments except in MA and ME fed fish Carcasses. The slight difference in their moisture contents might be due to environmental temperature variation during carcass analysis (Johnny and Jude, 2017).

Conclusion

From the findings, it was concluded that, incorporation of plants additive in the diet of *Clarias gariepinus* fingerlings can enhance its composition. This should be preferred to antibiotics due their side effects.

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