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Effect of Aridan Pod Powder (Tetrapleura tetraptera) On the Growth Performance of African Catfish (Clarias gariepinus)

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Abstract

Three hundred and fifty (300) juvenile fish of *Clarias gariepinus* were used to examine the effect of *Tetrapluera tetraptera* on the growth performance and survival rate of *Clarias gariepinus* After two weeks of acclimatization, fishes were allotted to five (5) dietary treatment, each treatment had (20) fishes per replicate. The experiment lasted for eight weeks (8 weeks) parameters taken were growth and survival rate, the treatment A serves as control, the fishes in this treatment was fed with compounded experimental feed at 0%inclusion of *Tetrapluera tetraptera*, treatment B were fed with compounded experimental feed of 2.5% inclusion of *Tetrapluera tetraptera*, treatment C were fed with compounded experimental feed with 5.0% inclusion of *Tetrapluera tetraptera*, treatment D was fed with compounded experimental feed with 7.5% inclusion of *Tetrapluera tetraptera* and treatment E were fed with compounded experimental feed with 10.0% inclusion of *Tetrapluera tetraptera*. It was discovered that treatment B fed with 2.5% compounded experimental feed of *Tetrapluera tetraptera* inclusion performed best in terms of weight gain (7.85g) follow by treatment C (3.48g), treatment A (1.54g), treatment D (0.83g) and treatment E (0.63g). Treatment B has the highest survival rate (78.00%) followed by treatment C (65.50%), treatment D (55.00%), treatment A (48.00%) and treatment E (42.00%).

Keywords: *African catfish, growth, Tetrapleura tetraptera, pod and survival rate*

Introduction

Fish is an important source of protein to the large teaming population of Nigeria. Fish provides 40% of the dietary intake of animal protein to the average Nigerian (FDF, 2007). There are various reasons for the merits of eating fish. One such reason is that fish is less tough and more digestible compared to beef, mutton, chicken and bush meat. This is possible because of the greater ratio of muscle protein to connective tissues protein in fish in relation to other animals thus making fish acceptable by infants and adults. Due to its greater digestibility, fish is usually recommended to patients with digestive disorders such as ulcers (Eyo, 2001). Food fish has a nutrient profile superior to all terrestrial meats (beef, pork and chicken etc.) being an excellent source of high-quality animal protein and highly digestible energy. It is also a good source of sulphur and essential amino acids such as lysine, leucine, valine and arginine. It is therefore suitable for supplementing diets of high carbohydrates contents (Amiengheme, 2005). Attention has been focused recently on the relationship between fish consumption and reduced incidence of cardiovascular disease. The benefit has been attributed to the nature of the fats in fish, for fish oil; unlike other fats in other food is the only type that supplies omega-3 poly unsaturated fatty acids (Daniel *et al*., 2011). PUFAs are essential in lowering blood cholesterol level and high blood pressure. It is able to mitigate to alleviate platelet of (cholesterol) aggregation and various arteriosclerosis conditions in adult population. It helps in prevention of asthma, arthritis, psoriasis and sonic type of cancer (Chiang and Qucek 2017). It reduces the risk of sudden death from heart attacks and reduces rheumatoid arthritis. Omega-3 fatty acids also lower the risk of age-related muscular degeneration and vision impairment, decrease the risk of bowel cancer; and reduces insulin resistance in skeletal muscles. According to Adekoya and Miller (2004), fish and fish

products constitute more than 60% of the total protein intake in adults especially in rural areas. According to FAO (2006), to maintain the present per caput fish consumption level of 13kg per year, 2.0 million metric tons of food fish would be required. It has been noted by some workers that the only means of meeting up with this annual fish demand for the country would be through a pragmatic option of intensive fish farming (Viveen *et al*., 1990).

African catfish (*Claris gariepinus*) due to its hardness and ability to feed on other agriculture waste products and tolerant to varying environmental condition this attribute give it better chance of survival than other species of fish such as tilapia and carp, it also has good growth rate can easily accepts feed such as oil cakes brewery waste rice and wheat bran (Gietema,1992). Aquaculture therefore remains the only available alternative for increasing fish production in order to meet protein need of the people. Nigeria is blessed with suitable land where fresh water brackish and marine fish species can be cultured according to (Tobor, 1990).

Many developing countries of the world are endowed with vast resources of natural products. The priceless heritage which includes indigenous fruits has served as food and medicine by rural people for centuries (. Abdel-Latif *et al*., 2022). Nigeria is blessed with a lot of indigenous fruit species with high nutritional, medicinal and economic importance to the society. One of these indigenous fruits is *Tetrapleura traptera* commonly known as Aridan (fruit) in Yoruba, belongs to Fabaceaa family. It is common on the fringe of West African rainforest belt. The trees are widespread in tropical Africa, in forest and at their best in rainforest (Orwa *et al.*, 2009). It is a singled stemmed, robust, perennial tree of about 30m long. It is generally found in the low land forest and its fruits are green when tender, dark red-brown when fully ripe and are about 22–27cm long. Its pod is 4–5cm wide and has four longitudinal wing-like rather fleshy ridges about 2cm broad of which two are hard and woody. The hard, heavy and reddish wood is used for firewood, building poles, pestles, tool handles and carvings.

The economic and medicinal important of *T. tetraptera* are many, the fruits have been widely used in Nigeria for manufacturing of seasoning spices, soups pomades and soaps due to its pleasant aroma characteristics (Essien *et al.,* 1990 and Okwu, 2004) while it is use in Ghana as vitamin. It is also commonly used in soups of nursing mothers to prevent postpartum contractions. An infusion of the whole fruit is usually taken by convalescents for bathing in order to be relief from feverish conditions, for constipation and as an emetic. The soft parts of the fruit and the bark are known to contain sugars, tannins, traces of saponin and amino acids (Adesina *et al.,*1980). The plant has many traditional medicinal uses mainly in the management of convulsion, leprosy, inflammation and rheumatic pains. Infusion of the whole fruit can be taken as a recuperative tonic (Ojewole and Adewunmi, 2004). Due to the presence of caffeic acid content. The fruit is reported to have antitumor activity and anti-inflammatory property. Many works have been done on the plants of *Tetrapleura tetraptera* (Abi and Elegalam, 2007) but little has been reported on the chemical composition of fruits. This study investigated the mineral, vitamin and proximate content of the fruits and its effect on the growth of fish.

Materials And Methods

Location

The experiment was carried out at the Fisheries unit of Federal College of Agriculture Moor Plantation, Ibadan. The post juvenile African catfish were purchased from Aquatech Nigeria limited, Iyana Ade Oyo Area Ibadan. They were randomly divided into five treatments and fed with the Rannana fish feed for two-weeks for acclimatization before the experiment was commenced. To mitigate the environment as a result of the exposure of the plastic materials to atmospheric temperature, and the volume of the water used for the experiment, the fish were fed daily with 2mm feed size of the formulated feeds with inclusion of *T. tetraptera* at 4% body weight throughout the eight (8) weeks of experiments. The initial body weights (g) of the fish were taken using sensitive scale, before they were stocked. The top of the vessels was also covered with 5mm mesh size net to protect the stocks from jumping out while the water in the vessels were changed bi-weekly to avoid the buildup of nitrates and nitrites as effluent leaching was not possible due to the use of plastic materials.

The experiment has five treatments with three replicates which were as follows:

TA: contain the include of *T. tetraptera* at 0.0%

TB: contains the inclusion of *T. tetraptera* at 2.5%

TC: contains the inclusion of *T. tetraptera* at 5.0%

TD: contains the inclusion of *T. tetraptera* at7.5%

TE: contains the inclusion of *T. tetraptera* at 10.0%

The following parameters were measured:

1. Live weight (g) of the fish using sensitive top loading scale

2. Feed in-take of the fish using sensitive top loading

scale

Some of the data generated were used to calculate weight gain and Mortality was monitored and record on daily basis.

Proximate analysis of the experimental diet and *T. tetraptera* was done at SMO laboratory along Joyce 'B' Ring Road Ibadan, Oyo state.

Data obtained were subjected to analysis of variance (ANOVA) using generalized model of SAS moonscape programmed version. Significant differences among means for treatments were portioned by Duncan Multiple Range test at 5% level of probability

Calculations

Live Weight Gain of Fish = Final body weight of fish – Initial body weight gain of fish.

Total Length Gain of Fish = Final body length of fish – Initial body length of fish.

Feed conversion ratio (FCR) = total feed intake (g)/total wet weight gain (g).

Specific Growth Rate = Final body weight of fish – Initial body weight of fish/No of Days reared.

Table 1: Gross composition (g/100g dry matter) of experimental diet containing varying levels of Tetrapleura *tetraptera* meal in the diet of *Clarias gariepinus*.

Ingredient	TA (0%)	TB (2.5%)	TC (5.0%)	TD (7.5%)	TE (10.0%)
FM (72%)	*30.55*	*30.55*	*30.55*	*30.55*	*30.55*
SBM (45%)	*42.20*	*42.20*	*42.20*	*42.20*	*42.20*
YM (%)	*10.00*	*10.00*	*10.00*	*10.00*	*10.00*
FISH PREMIX	*2.50*	*2.50*	*2.50*	*2.50*	*2.50*
FISH OIL	*2.50*	*2.50*	*2.50*	*2.50*	*2.50*
T.TM	*0*	*2.50*	*5.00*	*7.25*	*10.00*
STARCH	*12.25*	*9.75*	*7.25*	*5.00*	*2.25*

Key: FM: Fish Meal, YM: Yellow Maize, SBM: Soya Bean Meal, T.TM: *Tetrapleura tetraptera* Meal.

The table above shows the gross composition of experimental diet containing *Tetrapleura tetraptera* feed to experimental fish.

Table 2: Phytochemical in *Tetrapleura tetraptera* meal (mg/100g)

Content	Amount
Tannin	*967.25*
Saponin	*786.88*
Flavonoid	*298.77*
Total polyphenol	*1896.17*

Table 3: Proximate Composition of Nutritional Content on The Diet.

Sample Code (%)	*Crude Protein (%)*	*Moisture Content (%)*	*Ether Extract (%)*	*Crude Fiber (%)*	*Ash Content (%)*	*Dry Matter (%)*	*Nitrogen free Extract (%)*
TA	*38.89*	*9.21*	*2.67*	*1.65*	*8.61*	*90.79*	*38.97*
TB	*38.91*	*9.64*	*2.58*	*1.73*	*8.68*	*90.54*	*38.46*
TC	*39.47*	*9.38*	*2.63*	*1.76*	*8.79*	*90.62*	*38.03*
TD	*39.88*	*9.21*	*2.67*	*1.83*	*8.79*	*90.79*	*37.62*
TE	*40.08*	*9.16*	*2.76*	*1.89*	*8.96*	*90.84*	*37.15*
T.TM	*6.37*	*6.49*	*1.86*	*3.79*	*4.29*	*93.51*	*77.80*

KEY: T.TM: *Tetrapleura tetraptera* meal.

Table 4: Mineral Composition of *Tetrapleura tetraptera* meal

Content	Amount
Sodium (%)	*0.119*
Potassium (%)	*0.863*
Calcium (%)	*0.137*
Copper (mg/kg)	*5.800*
Zinc (mg/kg)	*13.20*
Iron (mg/kg)	*48.200*

Results

Table 5 shows the effect of *Tetrapleura tetraptera* meal on the growth performance of experimental fish. The highest mean value weight gain was observed in the TB (5.85g) followed by TC (3.48g), TA (1.54g) and TD (0.83g) while the lowest weight gain was in TE (0.63g). Feed intake was significantly (p<0>

In the final weight gain in which TB had the highest weight gain of 9.85g, follow by TC (7.43g) and TE, TD with 4.63g and 4.83g respectively compare to control. There was significant difference (p<0>

Table 5: Effect of Tetrapleura *tetraptera* Meal on the performance of the catfish

Parameters	TA	TB	TC	TD	TE	SEM±
Initial Weight (g)	*4.00*	*4.00*	*4.00*	*4.00*	*4.00*	*0.00*
Final Weight (g)	*5.54bc*	*9.85a*	*7.43b*	*4.83c*	*4.63c*	*0.51*
Weight Gain (g)	*1.54bc*	*5.85a*	*3.48b*	*0.83c*	*0.63c*	*0.52*
Feed Intake (g)	*3.50bc*	*6.20 a*	*5.60c*	*3.00bc*	*2.00c*	*0.54*
FCR	*2.27bc*	*1.06b*	*1.61b*	*3.61c*	*3.17c*	*0.53*
Survival Rate (%)	*48.00c*	*70.00a*	*65.50b*	*55.00bc*	*42.00c*	*0.52*

abc Means on the same row having different superscripts were significantly different(p>0.05).

Ta- control 0% Tetrapleura tetraptera meal**, Tb-** 2.5% *Tetrapleura tetraptera* meal**, Tc -**5% *Tetrapleura tetraptera* meal**, Td -** 7.5% *Tetrapleura tetraptera* meal**, Te -**10% *Tetrapleura tetraptera* meal, **FCR -** Feeds Conversion Ratio

Table 6 shows the carcass analysis of the fish with treatment B having the highest mean value (12.67g) in live weight, followed by Treatment C (10.66g), D (9.00g) E (8.4g6) and treatment A having the least mean value of (8.33g). In the head without gill and muscle, there were no significant differences in the mean value of treatment A (2.53), D (2.67) and E (2.33) while treatment B had the highest mean value of (4.36g) follow by Treatment C (3.67g). Also, in the whole body with intestine, treatment B had the highest mean value of (11.43g) which is highly significant at 5% level of significance from other treatment, followed by treatment C with the mean value of (9.54g), treatment D (8.00g) and treatment E (7.43g) and treatment A (7.33g) having the mean value compare to other treatment. In the bone, there were no significant different between the mean value produced by treatment A (1.76g), C (2.22g) and D (1.89g) while treatment B (2.56g) has the highest mean value and treatment E having the least mean valve of (1.55g) at 5% level of significance. In the whole body without intestine, treatment B had the highest mean value of (9.10g) followed by treatment C (8.90g), treatment D (7.67g), treatment E (6.34) and treatment A having the least mean value of (5.55g) at 5% level of significance. In intestine treatment B had the highest mean value of (1.30g) at 5% level of significance, follow by treatment C having the mean value of (0.79g) and with no significant different between the mean value produced by treatment A (0.26g), D (0.43g) and E (0.20g). In muscle, treatment B had the highest mean value of (5.67g) followed by treatment C (4.78g) and treatment D (4.78g) with treatment E (2.98g) having the least mean value.

Table 6: Carcass Analysis of Experimental Fish

Parameters	TA	TB	TC	TD	TE
LW(g)	*8.33c*	*12.67a*	*10.66b*	*9.00ab*	*8.46c*
HG(g)	*4.00a*	*5.00a*	*4.56a*	*3.33a*	*3.33a*
$H^{O}G$(g)	*2.53b*	*4.36a*	*3.67ab*	*2.67b*	*2.33b*
G	*0.76b*	*1.8a*	*1.6a*	*0.66b*	*0.89ab*
WB+I+B	*7.33b*	*11.43a*	*9.54ab*	*8.00b*	*7.43b*
WB-I	*5.55b*	*9.10a*	*8.98a*	*7.67ab*	*6.34b*
B	*1.76ab*	*2.56a*	*2.22ab*	*1.89ab*	*1.55b*
I	*0.26b*	*1.30a*	*0.79ab*	*0.43b*	*0.20b*
M	*3.80a*	*5.67a*	*4.78a*	*4.78a*	*2.98a*

abc means on the same row having different superscripts were significantly different($p>0.05$)

LW (g)- Live weight, HG (g)- Head with gill, HOG (g)- Head without gill, G-Gill, WB+I+B- Whole body with intestine and bone, WB-I- Whole body without intestine, B- Bone only, I- Intestine only, M- Muscles

Discussion

Based on the result obtained from this study, it shows that the final weight gain of treatment C (7.43g) and treatment E, treatment D, and treatment A respectively have no significant different the value of 4.63g, 4.83g, and 5.54g. Treatment B which was fed with 2.5% of *Tetrapleura tetraptera* meal had the highest weight of 11.85g, this report is in accordance with Eyo (2006) who reported that fish fed with adequate supplement will have good body weight apart from the main feed. The feed intake also enhanced the carcass performance in which treatment B had the highest feed intake which help the performance of the carcass characteristics such as Live Weight, Head with Gills, Head without Gills and Bone with the value of 12.67g, 5.00g, 4.36g and 2.56g respectively while treatment A (control) had the lowest performance in Live Weight, Whole Body with Intestine, Whole Body with Intestine and Bone, with value of 8.33g, 5.55g, 7.33g respectively, the weight gain of fish in treatment B fed with 2.5% of experimental diet as no adverse effect on fish this was in agreement with the result of (Abi and Elegram 2007) who reported that *Tetrapluera tetraptera* contains phosphorus for the maintenance of healthy bones and teeth, energy metabolism and acid base balance in the body which enhance proper growth. Treatment B also had the lowest mortality rate which is in agreement and accordance with the report of (Yamamoto and Gaynor, 2001) who reported that with moderate amount of *Tetrapleura tetraptera* the survival rate of livestock will be improved.

Conclusion and Recommendation

The result of the study shows that feed additive enhances nutrient utilization, which is reflected in improved weight and the feed conversion ratio. These agreed with result obtained from the study that TB fed with 2.5% *Tetrapleura tetraptera* inclusion had the highest weight gain. Also 2.5% inclusion can be state as the standard level of inclusion of *Tetrapleura tetraptera* in the diet of catfish. As feed additive, *Tetrapleura tetraptera* also enhance the growth of catfish, and reduces the rate of mortality in fish at 2.5%. It can be recommended that *Tetrapleura tetraptera* should be included in the diet of catfish at a rate of 2.5% to improve the growth performance and increase the immunity of fish. However, similar study should be carried out in a pond to ascertain the effect of other factors which might have interfered with the condition to get accurate result.

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