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The Performance of the Broilers Chickens on African Porridge Fruit (*Tetrapleura tetraptera*) Pod under Different Feeding Regimes

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ABSTRACT

A study was conducted to evaluate the effect of African porridge fruit (*Tetrapleura tetraptera)* pod on broiler chicken in Animal Science Department, Ebonyi State University Abakaliki, Nigeria. The aim was to determine the growth performance, gut microbes and some haematological indices of finishing broiler chickens under three *Tetrapleura tetraptera* feeding regimes. The three feeding regimes were cold water extract, boiled water extract and feed inclusion of *Tetrapleura tetraptera*. Feed intake, weight gain, carcass traits and faecal microbial loads were determined. Economic analyses were also conducted at the end of the four weeks experiment. There were no significant differences ($p>.0.05$) in the feed intake as well as weight gain and feed conversion ratio. The dressed weights of the broilers in the *Tetrapleura tetraptera* feeding regimes diets were better than those birds on the diets without *Tetrapleura tetraptera* regime. Also there was significant differences ($p<0.05$) in blood components of broiler chickens under the feeding regimes. The Pack Cell Volume (PCV), Red Blood Cells (RBC) and White Blood Cells (WBC) in improved with cold water. The gross margin and benefit-cost ratio were higher with *Tetrapleura tetraptera* feeding regimes than that without the *Tetrapleura tetraptera*. There was no significant difference ($p>0.05$) in the microbial load of the feacal samples. However, there was marginal higher load of *E. coli* in the diets without *Tetrapeura tetraptera*. The diets fed with cold water *Tetrapleura tetraptera* had the least microbial load.

Key words: *Tetrapeura tetraptera*, African porridge fruit, poultry diet, growth performance, gut microbes

INTRODUCTION

African porridge fruit (*Tetrapteura tetraptera*) is from the family of Mimosaceae. It is locally known in all the parts of Nigeria. It is called by several names by various Nigeria ethnics group. The plant is a single stemmed and robust perennial tree of about 30 m. It has a grey/brown, smooth/rough bark with glabrous young branch-lets and generally found in many African countries. The flower is yellow/pink and racemes while the fruit has dark consist of a fleshy pulp with small, brownish black seeds. It possesses a fragrant and characteristically pungent aromatic odor which is attributed to its insect repellent property (Aladesanmi, 2007). The fruits are green when tender and darker brown when fully ripe. The fruit has both nutritional and therapeutic attribute to man. Report has shown that the plant species has the potential of providing an alternative drug therapy because it has some antibiotic property (Jithendran, 1997).

Orthodox drugs such as antibiotics, anthelminth, coccidiostat and vitamins are some of the popular medicine for preventing and treating various pathogenic diseases which affect the health of farm animals. However, these drugs contribute significantly to the cost of inputs in the overall production process. The side effect of these drugs to farm animals especially in some areas where drug adulteration is prevalent has made many animal health experts beginning to think of alternative cheap, less harmful and accessible drugs for livestock disease prevention and treatment (Dipeolu *et al*., 2000). Drugs resistance particularly antibiotic is becoming a major problem in animal health management and public health (CAST, 1981). Also the adverse effect pose by drug residue particularly antibiotics in livestock production is assuming worrisome dimension in public health so that many countries are currently banning the use of these drugs because of public health implication (Ibrahim *et al*., 1997). The use of alternative drug therapy in animal health is necessary due to the fact that pathogenic organism are becoming resistance to the antibiotics drug therapy (Dipeolu and Idowu, 2004). Therefore, the use of spices that is less toxic to farm animals becomes necessary (Adewunmi *et al*., 2001). Among these spices is *Tetrapleura tetraptera,* a popular plant pod used extensively as spice in human diets in Nigeria and elsewhere (Dosunmu, 1997). The use of these spices could be of great benefit in animal health management because of its medicinal and nutritional properties (Adewunmi and Ogbe, 1986). This work is therefore, necessary because of the current emphasis on the alternative medicine that may show less resistance and pose a strong defense for effective control of diseases.

MATERIALS AND METHODS

Sixty-four brooded Anak broiler chicks at the age of four weeks old were randomly allocated to four treatments in Complete Randomized Design (CRD). Each treatment contains four replicates of four birds each. Milled *Tetrapleura tetraptera* was divided into three portions. The first part was mixed with cold water at the rate of 4 g L^{-1}. Each mixture was allowed to stay for two hours and then filtered. The second part was also mixed in 4 g L^{-1} of boiled water for two hours and filtered. The filtrate of the II and III was administered to birds by drinking water. The third part was used to compound feed 0.04% (4 g 100 kg^{-1}) and was administered through feed as treatment IV. *Tetrapleura tetraptera* was not added either in water or feed for the control experiment which was, administered to the birds as treatment I. However, normal medication with antibiotic,

Table 1: The composition of the experimental finisher diets

Ingredients	Control	Cold water	Hot water	Feed
Maize	50.00	50.00	50.00	50.00
Full fat soybean	12.00	12.00	12.00	12.00
Groundnut cake	13.00	13.00	13.00	13.00
Palm kernel cake	13.00	13.00	13.00	13.00
Maize offal	5.00	5.00	5.00	4.60
Fish meal	3.00	3.00	3.00	3.00
Bone meal	3.00	3.00	3.00	3.00
Premix	0.50	0.50	0.50	0.50
Salt	0.50	0.50	0.50	0.50
Tetrapleura tetraptera total (kg)	-	-	-	0.40
Calculated analysis	100.00	100.00	100.00	100.00
Crude protein (%)	019.51	19.51	19.51	19.51
Met. Energy (kcal kg^{-1})	00.27341	00.27341	00.27341	00.27341

anthelminthics and anticoccidial (Orthodox) drugs were carried out in treatment 1. The feed intake and weight gain was monitored for four weeks. Table 1 shows the feed composition of the experimental diet.

Carcass characteristics and economy of production: At 28 days of experiment, three birds were randomly selected from each dietary treatment for carcass evaluation. They were kept off feed and water overnight after which they were weighed and killed by neck slitting. Evisceration was done by hand plucking of feathers in warm water, removal of shank and viscera and weighted. The dressed carcass weight was used to determine the dressing out percentage as:

$$\text{Dressing out percentage} = \frac{\text{weight of dressed carcass}}{\text{Weight of live bird}} \times \frac{100}{1}$$

The cost of feed and drug were determined by using the production market price of feed ingredients and orthodox drugs as well as cost of *Tetrapleura tetraptera*. The market weight of the average dressed birds was used to calculate the returns on the use of drug and *Tetrapleura tetraptera*. The Gross margin was calculated by subtracting the production cost (Naira/kg) from the return (Naira/kg) of each bird during the experimental period. The benefit cost ratio was also determined by return on product divided by cost of production.

Haematological study: The chicks were recaptured around fledging and blood was taken from the tarsal Vein with syringes and dropped in blood collecting tube containing ethylenediaminetetra acetate solution. The blood was preserved with this solution which was used for haematological study. The 0.02 mL of blood was added to 1 mL of the HCl and then mixed. After mixing additional 1/10 HCl was added until the color matches with standard in the Saline tube. Then reading was taken to determine the Hemoglobin (Hb). Another 0.02 mL of blood was added to 0.38 mL of turk's solution in a test tube and then allowed to stay for about 10-20 min. The solution was charged unto a counting chamber and examined with ×10 magnification lens of microscope to determine the White Blood Cells (WBC). Differential count was conducted by using a thin film made with the blood samples. The blood sample was allowed to air dried and then stained magnification lens to determine the deferential blood count (Cheesbrough, 1994).

Microbial study: The faecal sample was collected using sterile spatula to collect freshly poultry dropping into sample bottle. Small sample of the faeces from the same pen was cultured in tryptone water and incubated for about 24 h. A kovac's reagent was added in two drops to the culture medium.

An indole test: The second part of samples was used for hull cultured medium which contain sodium citrate ammonium salt and bromoethyl blue indicator. An indole production was seen by the formation of red coloured compound which was an indication of *E. coli* (Cheesbrough, 1994).

Fungal test: Another part of faecal sample was examined first under the low power microscope. The cover slip was removed and discarded the agar block without unduly disturbed rectangles of growth on the slide. Immediately a drop of 95% ethyl alcohol was added to the growth on slide and

dried, followed by the addition of drop of lacto-phenol blue stain and gentle application of a cover slip. The two slide preparations were examined under the low and high power of the microscope (Ogbo, 2005).

Protozoa: Some of the faecal sample was examined with normal saline solution.

RESULTS AND DISCUSSION

Table 2 shows the growth performance characteristics for finishing broilers fed on *Tetrapleura tetraptera* diets. The result indicated that there was no significant difference ($p>0.05$) among the treatments in the voluntary feed intake; final body weight and body weight gain of the experimental treatments. It appeared that *Tetrapleura tetraptera* depressed the feed consumption of broilers slightly (139.57, 139.24 and 137.62 g for cold water, boiled water and feed, respectively as against 150.20 g for control). However, the depression was very marginal. The dressed carcass weight was significantly ($p<0.05$) lowest in the broilers fed diet without *Tetrapleura tetraptera* diet (1207.62 g, as against 1326.60, 1314.21 g for the *Tetrapleura tetraptera* dietary treatments). Dressing out percentage was also lowest in the diet without *Tetrapleura tetraptera* (67.65% for the control as against 75.10, 75.00 and 75.60% for the *Tetrapleura tetraptera* dietary treatments. The reason for this could be subject for further investigation.

The result in Table 3 shows significant difference ($p<0.05$) in the cost of feed consumed by the broilers and price of body weight gain (N/kg) of the broilers. The cost of feeding the birds that had no *Tetrapleura tetraptera* in their diets were higher (61.15 kg/Naira) than the diets that contain *Tetrapleura tetraptera* in both feed (11.32 kg/Naira) and water (11.45 and 11.43 kg/Naira for cold and boiled water, respectively) while the price of body weight gain (N/kg) of birds fed with diets without *Tetrapleura tetraptera* were lower (784.92 kg/Naira for control as against 871.05, 862.29 and 854.24 kg/Naira for the *Tetrapleura tetraptera* dietary treatments). The result showed that the gross margin and benefit cost ratios was higher (76.70, 75.44 and 75.46%) in all the *Tetrapleura tetraptera* dietary treatment than the diets without *Tetrapleura tetraptera* (12.84%). The reason for higher cost of production with the corresponding lower gross margin and

Table 2: Growth performance characteristics of finishing broilers fed on *Tetrapleura tetraptera* diets

Parameter	Control	Cold water	Boiled water	Feed	SEM
Mean daily feed intake (g)	150.20	139.57	139.24	137.62	0.03
Mean daily weight gain (g)	52.79	52.59	52.08	51.69	0.05
Feed conversion ratio	02.85	02.65	02.67	02.66	0.01
Final body weight (g)	1785.10	1784.40	1768.80	1760.50	0.10
Dressed carcass weight (g)	1207.62^{b}	1326.60^{a}	1326.60^{a}	1314.21^{a}	0.11
Dressing %	67.65	75.10	75.00	75.60	0.03

a, and b means on the same row with different superscripts are significantly different ($p<0.05$)

Table 3: Economy of production of broilers fed on *Tetrapleura tetraptera* diets

Parameters	Control	Cold water	Boiled water	Feed	SEM
Cost of feed/drug kg/Naira	61.15^{a}	11.45^{b}	11.43^{b}	11.32^{b}	2.01
Price of dressed birds kg/Naira	784.92	871.05	862.29	854.24	0.67
Gross margin kg/Naira	723.80	723.80	859.60	854.24	0.05
Benefit/cost ratio	12.84	76.70	75.44	75.46	0.03

a, and b means on the same row with different superscripts are significantly different ($p<0.05$)

Table 4: The haematological characteristics of finishing broilers fed on *Tetrapleura tetraptera* diets

Parameters	Control	Cold water	Boiled water	Feed	SEM
PCV (%)	35.01	38.29	36.32	36.55	0.05
Hb (g dL^{-1})	7.85^{b}	10.00^{a}	9.21^{a}	9.53^{a}	0.10
RBC (10^{6} mm^{-3})	2.20^{c}	4.10^{a}	3.63^{b}	3.87^{b}	0.05
WBC (10^{3} mm^{-3})	1.50^{b}	2.40^{a}	2.00^{a}	2.10^{a}	0.15

a, and b means on the same row with different superscripts are significantly different ($p<0.05$)

Table 5: Faecal microbial Loads of the finishing broilers fed on *Tetrapleura tetraptera* diets

	Control		Cold water		Boiled water		Feed	
Microorganism	No. of isolate	Rate (%)	No. of isolate	Rate (%)	No. of isolate	Rate (%)	No. of isolate	Rate (%)
Enterobacteria	0	0.40	0	0.10	0	0.10	0	0.10
E. coli	2	0.50	1	0.30	2	0.30	0	0.10
Klebsella	0	0.10	0	0.30	2	0.30	2	0.30
Salmonella	0	0.10	0	0.30	0	0.30	0	0.30
Pastuella	0	0.50	0	0.50	0	0.50	0	0.30
Protozoa								
Emilia sp	0	0.30	0	0.50	0	0.50	0	0.50
Helminth oocyte	0	0.50	0	0.50	0	0.50	0	0.50

benefit cost ratio were attributed to the cost of orthodox drugs such as antibiotics, vitamins and anthelminthics which was about five times higher than the cost of *Tetrapleura tetraptera*.

Table 4 shows the haematological characteristics of the blood of the finishing broilers fed *Tetrapleura tetraptera* meal. The results shows that there were significant difference ($p<0.05$) in the blood components among the birds fed *Tetrapleura tetraptera*. There were lower blood components values among the broiler chicken that were fed diets without *Tetrapleura tetraptera*. The Packed Cell Volume (PCV) of broilers on cold water administration (T_2) was the highest (38.29% for T_2 as against 35.01% for control) indicating that cold water administration could be the most effective way of administrating *Tetrapleura tetraptera*. It also shows that *Tetrapleura tetraptera* was a red blood cell booster. In the same way, the Haemoglobin Count (Hb), Red Blood Cell (RBC) and While Blood Cell (WBC) were superior in cold water administration (10.00 g dL^{-1} of Hb, 4.10 (10^{6} mm^{-3}) RBC and 2.40(10^{3} mm^{-3} WBC as against 7.85 g dL^{-1} Hb, 2.20 RBC(10^{6} mm^{-3} and 1.50 WBC (10^{3} mm^{-3} for control) indicating that *Tetrapleura tetraptera* in cold water contributed in the productions of these blood components. It also revealed the immune system boosting ability and anti-pathogenic activity of *Tetrapleura tetraptera*. The reasons for immune system boosting and anti-pathogenic activity could be attributed to both nutritional and medical attributes of *Tetrapleura tetraptera* (Nwawu and Akali, 1986; Dosunmu, 1997). Since the PCV and the red blood component of birds fed on *Tetrapleura tetraptera* treated birds were higher than those that did not received *Tetrapleura tetraptera,* it could be an indication that the toxicants and some anti-nutritional agents such as lectin, cyanogens were low (Ani and Okorie, 2005; El-Izzi *et al*., 1990; Nwawu and Akali, 1986).

Table 5 shows the microbial loads in the faecal sample of finishing broilers fed *Tetrapleura tetraptera* diets. There was no significant difference ($p>0.05$) in the faecal microbial loads among the broilers chicken. However, the result showed slight increase of microbial load of *E. coli* in the diet (at rate 0.5% for control as against the 0.1-0.3% for the *Tetrapleura tetraptera* dietary treatments) in which *Tetrapleura tetraptera* was not administered. The lowest load was

found in cold-water administration followed by hot water administration (Rate 0.1 and 0.2% for cold water and boiled water, respectively).

CONCLUSION

The growth performance of broilers fed on *Tetrapleura tetraptera* diets was good and reduced cost of production; improved blood components and controlled microbial load in the broiler chicken. Its inclusion in feed or through water can be used to control gut-pathogenic organisms and therefore, is recommended for dietary intake through cold water.

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