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Performance Evaluation of Broiler Chickens Fed Varying Levels of Raw African Velvet Tamarind, *Icheku* (*Dialium guineense*) Wood Charcoal as Feed Additive

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Abstract
A 56-day trial with charcoal from the African velvet tamarind (*Icheku* in Igbo) wood as feed additive was carried out with 192 broiler chickens of mixed sexes. Charcoal meal was added to the formulated feed at 0, 0.5, 0.75 and 1.00kg, designated T^o, T^1, T^2 and T^3respectively. The birds were assigned to the feeds in a completely Randomized Design (CRD) experiment. The parameters utilized to judge the performance of the birds were; initial body weight, body weight change and daily body weight gain, daily feed intake, feed conversion ratio, feed cost, cost of broiler production, cost of chicken per kilogram, profit after sale and mortality. Results showed significant differences in performance between the control group and the rest of the trial groups in all parameters except daily feed intake. It was further observed that flatulence did not occur in T^1, T^2 and T^3, while it continued in T^0.Domestic, green and bottle fly population decreased as the charcoal levels increased. Colour of the litter darkened increasingly fromT^1 to T^3.Odors from litter also decreased as charcoal level increased. It was concluded that inclusion of charcoal derived from the African velvet tamarind (AVT) wood in broiler rations be limited at 0.50kg per 100kg feed for economic reasons though lower inclusion levels can be explored.

Keywords: Broilers, African velvet tamarind, *Dialium guineense*, charcoal, feed

Introduction

The maximization of genetic potentials for growth and production is dependent on environmental factors, one of which is optimal feed supply. The ability of farm animals to utilize feed after proper digestion, assimilation and utilization is *sine qua non* to profitable livestock production. Any material that will be beneficial in achieving these will be accepted and deployed in feeding livestock. Charcoal whether activated or not is reported to be useful for humans, especially health wise. Charcoal is a light black residue consisting of carbon and any remaining ash obtained by removing water and other volatile constituents from animal and vegetable substances. It is produced by slow pyrolysis of heating wood or other substances in the absence of oxygen or from woods after use as fuel for cooking. It has high porosity and immense internal surface area. Jiya *et al*. (2013) reported that charcoal adsorbs toxins such as aflatoxin, and other mycotoxins produced by fungi. A number of workers such as Kutlu and Gorgalu (2001), Kana and Mungfu (2010) reported that charcoal dissolves drugs, fat and fat soluble substances and absorbs gases. Charcoal contributes to regulating metabolic processes, maintains the proper osmotic potential of body fluid and activates enzymes, hormones and antibodies. Muat Van Uitert (2016) indicated that charcoal reduces diarrhea and improves the strength of egg shell. Owing to these attributes, it was necessary to investigate the value of charcoal in broiler nutrition.

This study determined the performance broiler chickens fed varying levels of raw charcoal derived from the wood of African velvet tamarind (*Dialium guineense*) as feed additive

Materials and Methods

The experiment was conducted at the Livestock Research Farm of the Imo State Polytechnic Umuagwo Ohaji Owerri Nigeria, which is situated at longitude 7.4^{0}N and between latitude 5^{0}N and 6^{0}N of the equator. The annual rainfall ranges from 2000 to 2484mm. The location is classified as low land forest belt that has relative humidity of about 70%, while the temperatures range is 23-34^{0}C.

Raw charcoal from AVT(*Dialium guineense*) woods was bought from a commercial charcoal stand in Owerri market and milled. Four experimental diets designated T^o, T^1,T^2 and T^3 in which 0.00, 0.50, 0.75 and 1.0kg charcoal meal was incorporated respectively were formulated. Table 1 shows the composition of the experimental diets.

Table 1: Ingredient and chemical composition of the experimental diet

Ingredient	T^0	T^1	T^2	T^3
Maize	60.00	60.00	60.00	60.00
Charcoal	0.00	0.50	0.75	1.00
Soya beam	10.00	10.00	10.00	10.00
Groundnut cake	10.00	10.00	10.00	10.00
Brew. Sp. grain	11.00	11.00	11.00	11.00
Fish meal	3.00	3.00	3.00	3.00
Bone meal	2.00	2.00	2.00	2.00
Oyster shell meal	3.00	3.00	3.00	3.00
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
* Premix	0.25	0.25	0.25	0.25
Chemical Composition				
Crude protein	20.10	20.10	20.10	20.10
Crude fibre	6.17	6.17	6.17	6.17
Ether extract	4.33	4.33	4.33	4.33
Calcium	1.96	1.96	1.96	1.96
Phosphorus	0.56	0.56	0.56	0.56
ME (Kcal/Kg)	3096	3096	3096	3096

One hundred and ninety-two Zatech day old broiler birds of mixed sexes were purchased from Pamalaw Enterprises Owerri. The birds were assigned to the four experimental feeds in a Completely Randomized Design (CRD) experiment. Each group was further divided into three replicates of 16 birds each. All management practices and medication were observed. The experiment lasted for 56 days. The performance of the birds were judged using the following parameters initial body weight, final body weight, body weight change, feed intake, feed conversion ratio, cost of feed, cost of broiler production, profit, mortality.

Data collected were subject to analysis of variance (ANOVA) according to Snedecor and Cochran (1978) and where significant differences were detected, means were separated as described by Obi (1990).

Results and Discussion

Table 2 shows the performance of the birds. The initial body weights of the different groups were 480.50, 481.20, 481.40 and 480.60g for – T^0, T^1,T^2 and T^3 respectively. Their final body weights were T^0:1870.06g, T^1: 1997.01g, T^2:1972.03g and T^3:1974.31g. There was significant difference ($p<0.05$) between the groups. The group in T^0 had the lowest body weight (1870.06g), T^1 had 1997.01g while the rest – T^2 and T^3 had 1972 and 1974.31g respectively. In body weight gain, T^0 gained 1389.56g. Other's gain were 1515.81, 1490.63 and 1493.71g respectively for T^1, T^2 and T^3. The trend shows significant ($p<0.05$) difference between T^0 on one hand and T^1, T^2 and T^3 groups on the other. Similarly, the daily weight gain showed same pattern as the body weight gain. The group to T^0 gained 49.63g against 54.14, 53.24, and 53.35g gained by T^1, T^2 and T^3 respectively. No significant difference ($p>0.05$) was observed on feed intake. The consumption was 80.95, 80.45, 80.76 and 80.70g by T^0, T^1, T^2 and T^3 respectively. The control group T^o showed significant difference ($p<0.05$) in feed conversion ratio – 1.63g against 1.50, 1.52 and 1.51 for T^1, T^2 and T^3.

No significant difference ($p>0.05$) was experienced on cost of feed. The cost for T^0, T^1, T^2 and T^3 were N63.70, N64.00, N64.43 and N64.61 respectively. There was however significant difference ($p<0.05$) in cost of production of broiler chickens between the control group and the rest of the treatment groups. While it cost N103.83 to produce the control group, it cost N96.00, N97.93 and ₦98.21 to produce T^1, T^2 and T^3 groups respectively. The estimated sale price was ₦1870, ₦1997.01, ₦1972.03 and ₦1876.10 for T^0, T^1, T^2 and T^3 respectively. In both sale and profit considerations, the control scored lower revenue earnings than the rest of the groups. No mortality was experienced during the period the experiment lasted.

Table 2: Performance of broiler chickens fed graded levels of raw AVTwood charcoal meal as feed additive.

Parameters	T^o	T^1	T^2	T^3	SEM
Initial body lot (g)	480.06	481.20	481.40	481.40	
Final body lot (g)	1870.06	1997.01	1972.03	1974.03	0.14
Body weight gain (g)	1389.56	1515.81	1490.63	1490.71	140.0
Daily weight gain(g)	49.63	54.14	53.24	53.35	5.24
Daily feed intake (g)	80.95	80.45	80.76	80.70	6.80
Feed Conversion Ratio	1.63	1.50	1.52	1.51	
Cost of feed (₦)	63.70	64.00	64.43	64.61	
Cost of broiler production (₦)	103.83	96.00	97.93	98.21	
Cost of chicken (₦/kg)	1000.00	1000.00	1000.00	1000.00	
Sale price	1870.56	1997.01	1972.03	1974.31	
Profit after sale	1766.73	1901.01	1874.10	1876.10	
Mortality	0.00	0.00	0.00	0.00	

₦ - Nigerian Currency Symbol

It was observed that the droppings in the pen of T^0 was more odorous than those of T^1, T^2 and T^3.The odour decreased as the inclusion levels of the charcoal increased. Domestic fly (*Musca domestica*) count on the litter decreased with wide margin as the charcoal level increased. The control group (T^0 attracted higher fly population than the other groups put together. These agree with the reports of Kana *et al.* (2010). It was further observed that the colour of the birds' droppings increased in dark colour from T^1 to T^3. This implies that the charcoal was excreted in the dropping. This was possibly responsible for the reduced odour in the pens of T^1, T^2 and T^3 and decreased fly population. Charcoal has adsorbent characteristic for odour, gas and moisture. Absence of flatulence was observed in, T^1 through T^3 but occurred in T^0.Flatulence leads to throwing up of ingesta which spread intestinal diseases. These results and observations appear to be at variance with those of Odunsi *et al.* (2007) who added vegetable oil to the charcoal they used.

Conclusion

Interesting observations of economic importance were made as AVT charcoal was added in the broiler feed as an additive. It was recommended that the inclusion level be limited at 0.50 kg per 100 kg feed since no significant result was obtained after this level. However, lower levels can be explored for significance.

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