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Growth Response, Haematology and Carcass Characteristics of Broiler Chickens fed Diets Supplemented with *Petiveria alliacea* Root Meal

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Target audience: Poultry farmer, nutritionist, feed millers, extension officers

Abstract

An experiment was conducted with one hundred and eighty (180) unsexed day old broiler chicks of Cobb strain to investigate the effects of feeding diets supplemented with Petevaria alliacaea root meal (PRM) on the performance and carcass characteristics of broiler chicken. The broiler chicken were brooded together for 7 days after which they were randomly distributed into 6 dietary treatments of 30 birds per treatment which were further divided into 3 replicates of 10 birds per replicate in a completely randomized design. Six dietary treatments were formulated such that T1 which is control contained 0.00g/100kg of feed, while T2, T3, T4, T5 and T6 contained 500.00, 1000.00, 1500.00, 2000.00 and 2500.00g/kg of feed respectively. Data were collected on feed intake and weekly weight gain. Blood samples were collected from the animals through the wing web vein for haematological indices evaluation. At 56 days of the experiment, 6 birds were randomly selected per treatment, starved overnight, weighed and sacrificed by cervical dislocation for carcass analysis. Results revealed no significant (P>0.05) difference in all performance characteristics indices measured. Packed cell volume, Haemoglobin concentration, Heterophil and monocytes were significantly (P<0.05) influenced PRM supplementation. The results of carcass characteristics showed significant (P<0.05) difference in the values obtained for gastro intestinal tract, gizzard, heart and liver. It can be concluded that supplementing broilers diets with graded levels of PRM had no detrimental effects on the performance, haematological parameters and carcass characteristics.

Key words: Broiler, performance, haematology, carcass characteristics

Description of problem

The demand for livestock products increases as the human population is increasing in the developing countries of the world (1). For instance, total meat production in the developing world tripled between 1980 and 2002 from 45 to 134 million tonnes (2). Demand for meat grew only by about 0.6 percent in developed countries compared to an annual increase of 2.8 percent in the developing countries.

Over the years, a variety of non nutritive feed additives have been used in poultry

production to improve the performance of poultry birds. Antibiotics growth promoters (AGP) have been included in poultry diets to promote growth, health and to maximize the genetic potentials of modern poultry (3). However, the presence of residue of antibiotics in meat and meat products meant for human consumption and the development of drug resistant micro organisms in human has brought about the search for alternative plant extract as antibiotic and growth promoters (4). Researchers (5, 6,7 and 8) have identified several beneficial chemical components in medicinal plants which play an important role in improving production and immune system of birds against diseases and have strong medicinal value and could be utilized as natural growth promoters to replicate antibiotics and other synthetic feed additives. The environment of man is endowed with plants and fruit which over time has been found to be of great nutritional and health importance to man and animals. Such plants and fruits constitute sources of spices in food, stimulants and some micro nutrients while others may have aphrodisiac properties.

These plants or spices and fruits includes *Allium sativum* (garlic), *Zimgiber officinale* (ginger), *Piper nigrum* (pepper), *Solanum species* (egg plant), *Garcinia kola* (bitter kola) and *Petiveria alliacea* (Anamu), many of which have been extensively investigated and their properties documented (9, 10). Quite a number of these plant materials mentioned above have antimicrobial properties with tremendous therapeutic potentials (11, 12).

Petiveria alliacea (Anamu) is a species of flowering plant in the pokeweed family, phytolaccaceae that is native to Florida and the lower Rio Grande valley of Texas in the United States. Mexico, Central America, the Caribbean and tropical South America (13, 14). It is a deeply rooted herbaceous perennial shrub growing up to 1 meter (3.3 feet) in height and has small greenish pinnate flowers. The roots and leaves have a strong acrid garlic-like odour which taints the milk and meat of animals that graze on it (15, 13). It is known by a wide number of common names including, guinea henweed, anamu in the Dominican Republic and Brazil, mucura in Peru, mapurite in Trinidad and apacin in Guatemala (16). *P. alliacea* is used as a bat and insect repellant. It is also used in teas, extracts, capsules. The leaves and roots are used for medicinal purpose. This plant is reported to be used to eliminate bacteria, fungi, candida and viruses. It is also used to enhance the immune system and increase urination (14). Studies report beneficial results in the use of this plant to lower the blood sugar levels and in the elimination of cancer cells. The plant is also used for arthritis, allergies and as therapy for fever and malaria. Besides its beneficial medical uses, it has also been reported to induce abortions. This is an important property that needs to be taken into consideration when used by woman or animal of child bearing age (13, 14). This experiment was therefore, carried out to evaluate *Petiveria alliacea* root meal on the performance and carcass characteristics of broiler chicken.

Materials and methods

Collection and preparation of Petiveria alliacea Root Meal

Petiveria alliacea was sourced from different locations within and outside the campus of Federal College of Animal Health and Production Technology, Moor Plantation, Ibadan, South west Nigeria. The roots were cut from the stem, washed thoroughly and cut into pieces to increase the surface area. It was then air dried till a moisture content of about 10% was obtained. The air dried roots were milled into Petiveria root meal (PRM) and stored in an air-tight container until when needed for compounding.

Experimental diet formulation.

Six dietary treatments were formulated. Treatment one (1) which is the control, had no *Petiveria alliacea* root meal (PRM), while $T_{2,}$ $T_{3,}$ $T_{4,}$ $T_{5,}$ andT_{6} had 500,00g, 1000.00g, 1500.00g, 2000.00g and 2500.00g of *Petiveria alliacea* root meal (PRM) per 100kg of feed respectively.

Table 1: Gross composition of the experimental diets (g/100gDM) Starter phase

Parameters (%)	**T1**	**T2**	**T3**	**T4**	**T5**	**T6**
*PRM (g/100kg feed)	0.00	500..00	1000.00	1500.00	2000.00	2500.00
Maize	50.50	50.50	50.50	50.50	50.50	50.50
Groundnut cake	5.00	5.00	5.00	5.00	5.00	5.00
Soybean meal	30.00	30.00	30.00	30.00	30.00	30.00
Fish meal	2.00	2.00	2.00	2.00	2.00	2.00
Wheat offal	7.30	7.30	7.30	7.30	7.30	7.30
Bone meal	2.50	2.50	2.50	2.50	2.50	2.50
Salt	0.25	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10	0.10
Limestone	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**
Crude protein	22.67	22.78	23.15	23.37	23.58	23.64
Crude fibre	5.89	5.92	5.85	5.82	5.96	6.34
Total ash	7.85	7.68	8.67	8.88	8.74	7.76
Ether extract	3.75	3.82	3.79	3.77	3.85	3.83
Nitrogen free extract	56.66	49.55	48.26	47.95	47.72	48.20

PRM = ***Petiveria alliacea Root Meal***

Experimental animals and management

A total of one hundred and eighty (180) unsexed day -old Cobb strain of broiler chicks were used for this study. The chicks were randomly assigned to 6 dietary groups of three replicates with 10 birds per replicate in a completely randomized design. The birds were brooded together for 7 days before the commencement of the experiment. They were housed in an open sided pen, which has been provided with facilities for lighting, feeding and watering. Feed and water were provided *ad libitum*; litter condition was properly monitored and managed to prevent caking which could lead to outbreak of coccidiosis. Birds on T1 were medicated with antibiotics, while those on other treatments were not medicated. However normal routine vaccinations were carried out as at when due. Data were collected on feed intake, body weight and feed conversion.

Performance characteristics

Known quantity of feed was supplied to the birds and the left over removed and weighed to determine the actual feed consumed on daily basis. The daily feed consumption was added together over a period of 7 days to obtain the feed consumption per week.The body weights were taken on weekly basis. The difference between mean weights for two successive weeks was taken in order to obtain the average weight gain of birds per week.

Feed conversion ratio was calculated as a ratio of feed consumption and body weight gain

$$\text{Feed conversion ratio} = \frac{\text{Feed intake}}{\text{Weight gain}}$$

Haematological indices evaluation

At week 8, two birds per replicate were bled using hypodermic needle and syringe. Blood was drained into carefully labelled bottles for haematological indices evaluation. The blood samples were collected into the bottle pre-treated with EDTA, an anticoagulant. The haematological indices examined include Red Blood count (RBC), white blood cell (WBC), Packed cell volume (PCV), Leucocytes differential count (monocyte, lymphocyte, eosinophil e.tc) and haemoglobin concentration (Hb). The haematological parameters were analyzed as outlined by (17).

Carcass characteristics

At the end of eight (8) weeks of the experiment, two (2) birds per replicate were randomly selected, that is, six birds per treatment. They were starved overnight, weighed and slaughtered by severing the jugular vein. They were weighed again to know the slaughtered weight after which they were eviscerated, cut into different parts and their weights recorded. Organs' weight such as liver, spleen, kidney and heart were also recorded.

Table 2: Gross composition of the experimental die ts (g/100gDM) finisher phase

Parameters (%)	**T1**	**T2**	**T3**	**T4**	**T5**	**T6**
*PRM (g/100kg feed)	0.00	500..00	1000.00	1500.00	2000.00	2500.00
Maize	55.00	55.00	55.00	55.00	55.00	55.00
Groundnut cake	3.80	3.80	3.80	3.80	3.80	3.80
Soybean meal	30.00	30.00	30.00	30.00	30.00	30.00
Fish meal	1.00	1.00	1.00	1.00	1.00	1.00
Wheat offal	5.00	5.00	5.00	5.00	5.00	5.00
Bone meal	2.50	2.50	2.50	2.50	2.50	2.50
Salt	0.25	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10	0.10
Limestone	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**
Crude protein	18.65	18.89	19.15	19.48	19.57	20.13
Crude fibre	5.98	6.17	6.11	6.07	6.27	6.38
Total ash	7.92	7.97	7.88	7.79	7.85	7.68
Ether extract	3.69	3.66	3.72	3.68	3.64	3.74
Nitrogen free extract	53.40	52.86	52.75	52.47	52.19	51.58

*PRM = *Petiveria alliacea Root Meal*

Results

The performance characteristics of broilers fed diets supplemented with *Petiveria alliacaea* root meal (PRM) is as shown in Table 3. All parameters measured were not significantly (P>0.05) influenced by the dietary treatments. The results of the haematological parameters of broilers fed diets supplemented with PRM. PCV, Hb, heterophil and lymphocytes were significantly (P<0.05) influenced by the dietary treatments, while all other parameters were not significant. PCV ranged from 26.33 – 36.00 %. Hb, 8.43 – 11.40, Heterophil, 24.67 – 39.00 % and monocytes, 2.67 – 4.67 respectively. Table 5 shows the results of carcass characteristics of broilers fed diets supplemented with PRM. Significant (P<0.05) difference were recorded in mean values obtained for gastro intestinal tract, gizzard, heart and liver while all other parameters were not significant (P>0.05).

Table 3 : Performance characteristics of broilers fed diets supplemented with *Petevaria alliacaea* root meal

Parameters	T1	T2	T3	T4	T5	T6	± SE M
*PRM (g/100kg feed)	0.00	500.00	1000.00	1500.00	2000.00	2500.00	
Initial weight (g/bird)	130.00	130.00	125.33	126.67	128.33	125.33	0.00
Final weight (g/bird)	1983.33	2050.00	1866.67	1883.33	2150.00	2050.00	62.10
Weight gain (g/bird)	1853.33	1920.00	1741.33	1756.67	2021.67	1924.67	61.75
Feed consumed (g/bird)	5781.73	5788.37	5901.50	5765.20	5835.63	5920.07	71.46
Feed conversion ratio	3.23	3.00	3.43	3.33	2.93	3.13	0.10
Mortality (%)	3.33	3.33	3.33	0.00	3.33	3.33	1.09

Table 4: Haematological indices of broilers fed diets supplemented with *Petevaria alliacaea* root meal

Parameter	T1	T2	T3	T4	T5	T6	±SEM
*PRM (g/100kg feed)	0.00	500.00	1000.00	1500.00	2000.00	2500.00	
Packed cell volume (%)	26.33^{b}	26.67^{b}	33.00^{ab}	34.33^{a}	36.00^{a}	31.33^{ab}	4.91
Haemglobin (g/dl)	8.43^{b}	8.57^{b}	8.53^{ab}	10.13^{ab}	11.40^{a}	10.13^{ab}	1.50
Red blood cell	1.29	1.51	1.84	2.01	2.54	2.02	0.18
Mean cell volume	126.44	112.32	132.97	131.14	112.25	116.10	7.08
Mean corpuscular haemoglobin	42.16	37.56	43.40	39.07	35.83	39.17	2.32
MCHC	33.39	33.47	32.71	29.25	32.26	33.80	0.61
White blood cell (x10	1.62	1.54	1.32	1.30	1.62	1.72	0.11
Lymphocytes (%)	63.33	59.33	65.33	59.00	60.00	54.67	1.54
Heterophil (%)	27.33^{ab}	32.67^{ab}	24.67^{ab}	33.00^{ab}	34.00^{ab}	39.00^{a}	1.72
Monocytes (%)	4.67^{a}	4.00^{ab}	4.00^{ab}	4.33^{ab}	2.67^{b}	3.00^{ab}	0.25
Eosinophil (%)	4.67	4.00	5.33	3.67	3.33	4.33	0.33
Basophil (%)	0.33	0.00	0.67	0.00	0.00	0.33	0.10
Platelets	1.68	1.63	1.35	1.40	1.79	1.72	0.01

$^{a, ab, b}$ Means in the same row with different superscripts are significantly different (P<0.05)

Table 5: Carcass characteristics of broilers fed diets supplemented wit h *Petevaria alliacaea* root meal (% live weight)

Parameters	T1	T2	T3	T4	T5	T6	±SEM
*PRM (g/100kg feed)	0.00	500.00	1000.00	1500.00	2000.00	2500.00	
Live weight (kg)	1.98	2.05	1.87	1.88	2.15	2.05	0.06
Plucked weight	89.77	89.43	90.73	88.07	85.13	86.17	1.10
Eviscerated weight	75.70	75.27	74.77	74.67	69.97	70.70	1.13
Dress weight	64.07	61.13	63.40	61.07	56.77	56.60	4.95
Head	2.73	2.67	2.80	2.87	2.80	2.73	0.06
Neck	5.97	5.73	5.80	5.73	5.20	2.73	0.12
Breast	16.53	16.20	17.43	16.53	15.30	15.27	0.42
Wing	7.90	7.70	7.73	8.07	7.17	7.67	0.14
Drumstick	10.10	10.73	10.17	10.17	10.10	9.77	0.22
Thigh	11.73	11.30	10.90	11.00	10.20	10.03	0.22
			Organs	**Weight**			
GIT	7.00^{ab}	6.67^{ab}	7.73^{a}	5.67^{b}	7.87^{a}	8.30^{a}	0.30
Lungs	0.53	1.97	0.47	0.47	0.50	0.50	0.24
Kidney	0.53	0.53	0.53	0.60	0.50	0.60	0.02
Gizzard	2.90^{ab}	2.40^{b}	3.57^{a}	2.60^{b}	2.73^{ab}	3.17^{ab}	0.13
Spleen	0.10	0.08	0.10	0.10	0.10	0.10	0.00
Heart	0.67^{a}	0.53^{ab}	0.57^{a}	0.53^{ab}	0.40^{b}	0.63^{a}	0.03
Liver	1.90^{ab}	1.67^{b}	1.97^{ab}	2.00^{ab}	1.83^{ab}	2.37^{a}	0.08

Discussion

The non significant differences observed in the performance parameters measured in this study indicated that the test ingredient (*Petiveria alliacea* root meal) has no negative effect on the birds and this is in agreement with the report of (18) who supplemented ginger (*Zingiber officinale*) in the diets of broiler chicken. (19) also reported that dried medicinal crops have no negative effect on the broiler performance and carcass traits.

A readily available and fast means of assessing clinical and nutritional health status of animals on feeding trials may be the use of blood analysis, because ingestion of dietary components have measurable effects on blood composition (20) and may be considered as appropriate measure of long term nutritional status (21). According to (22) haematological studies have been found useful for disease prognosis and for the therapeutic and feed stress monitoring (23) observed that nutrition had significant effect on haematological values like PCV, Hb and RBC. All the haematological parameters measured fall within the normal range recommended for chicken by (24). This agreed with (25) who reported that when the haematological values fall within the normal range reported for the animal, it is an indication that diets not show any adverse effect on haematological parameters during the experimental period but when the values fall below the normal range, it is an indication of anaemia.

The carcass evaluation revealed that there were no significant ($p>0.05$) difference in all the parameters examined across the treatment. This also revealed that *Petiveria alliacea* root meal has no detrimental effect on the birds. The non significant ($p>0.05$) difference observed in the carcass parameters was contrary to the report of

(19) who supplemented *Garcinia kola* (bitter kola) in the diet of broiler, but agrees with the report of (20) who replaced sesame seed cake for methionine in broiler feeds. (21) also reported that carcass characteristics of birds were not negatively affected when Oregano leaf extracts were fed to birds. It also agrees with the concept that plant extracts improved the carcass yield of broiler chicken as reported by (22)

The results of the organ weight of broilers showed that aside the birds fed 1500g of *Petiveria alliacea* root meal, the weight of gastro intestinal tract (GIT) was increasing as the inclusion level of *Petiveria alliacea* root meal increased. This could be due to the high fibre content in *Petiveria alliacea* root meal. The range of values obtained for the gizzard and heart were lower than 3.17 to 3.59% (for gizzard) reported by (23) and 0.43 to 0.81% (heart) reported by (19). This may be as a result of gut thinning and shortening effect of antibiotics as reported by (24). Additionally, the significant ($p<0.05$) effect observed in the weight of heart among the treatment groups was contrary to the observations of (25) in goats that the heart, being a vital organ attained most of its mature weight during foetal development. The mean value obtained for the liver in this experiment is within the range (1.86 to 2.32%) reported by (19) when Bitter kola (*Garcinia kola*) was supplemented in the diet of broiler chicken.

The organs weight studied did not follow a similar trend as reported by (26) who supplemented garlic (*Allium sativum*) in the diet of broiler. This may be as a result of slight difference in the chemical properties of garlic (*Allium sativum*) and *Petiveria alliacea* root meal, difference in the level of supplementation, the strain of broiler used and environmental differences.

Conclusion and Applications

1. *Petiveria alliacea* root meal as a phytobiotics improved the performance of broiler chicken and also resulted into comparable performance with the control.
2. *The haematological indices revealed that Petiveria alliacea* root meal as phytobiotics does not have any negative effects haematological parameters.
3. The carcass characteristics showed that using *Petiveria alliacea* root meal as phytobiotics does not have any negative effects on the primer cuts.
4. Farmers can include *Petiveria alliacea* root meal as phytobiotics in the diets of their broilers for improved performance, health status and carcass qualities.

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