Nig. J. Anim. Prod. 2022, 49(2):68-74.https://doi.org/10.51791/njap.v49i2.3463 *Nigerian Journal of Animal Production*

Evaluation of processed blood and rumen contents of goat-based diets supplemented with phytogenic plant on growth and blood parameters of broiler chickens

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Abstract

This study was aimed at assessing the dietary utilization of processed goat blood rumen content mixture (GBRCM) with phytogenic plant supplementation for broiler chicken production. One hundred and twenty broiler chickens were allotted to three experimental diets in a completely randomized design to determine the effect of feeding supplemental phytogenic plant in a processed GBRCM based-diets on growth, haematological parameters and serum biochemical indices of broiler chicken. Each group was replicated four times with ten birds per replicate and the experiment lasted for five weeks. The parameters evaluated were body weight gain, feed intake, feed conversion ratio, protein intake, protein efficiency ratio, blood parameter. Results revealed that birds fed phytogenic plant supplemented diets had significantly ($p<0.05$) higher body weight gain, increased feed intake than those on unsupplemented and the control diets. The higher feed intakes obtained in supplemented diets revealed improved flavor, taste, and acceptability of the feed and increased appetite of the birds. There was no significant ($p>0.05$) difference in the parameters of the birds fed the control diet (T_1) and diet (T_2). The haematological and serum biochemistry indices revealed that there were significant ($P<0.05$) differences among the treatments, except white blood cell count where no significant ($P>0.05$) difference existed. Birds fed control diet had significantly higher($p<0.05$) cholesterol level than those fed diets GBRCM. The goat blood rumen content mixture based-diet supplemented with phytogenic plant could be included in the broiler chickens diets up to 10% goat blood rumen content mixture with 0.5g/kg rosemary without any adverse effect on performance.

Keywords: Phytogenic plant, Rosemary and broilerchickens

Évaluation du contenu sanguin et ruminal traité des régimes à base de chèvres complétés par des plantes phytogéniques sur la croissance et les paramètres sanguins des poulets à griller

Résumé

Cette étude visait à évaluer l'utilisation alimentaire du mélange de contenu de rumen de sang de chèvre transformé (CRSCT) avec une supplémentation en plantes phytogéniques pour la production de poulets à griller. Cent vingt poulets à griller ont été répartis dans trois régimes expérimentaux dans une conception complètement randomisée pour déterminer l'effet de l'alimentation supplémentaire de plantes phytogéniques dans un régime à base de CRSCT transformé sur la croissance, les paramètres hématologiques et les indices biochimiques sériques du poulet à griller. Chaque groupe a été répété quatre fois avec dix oiseaux par répétition et l'expérience a duré cinq semaines. Les paramètres évalués étaient le gain de poids corporel, l'apport alimentaire, l'indice de conversion alimentaire, l'apport protéique, le taux d'efficacité protéique, le paramètre sanguin. Les résultats ont révélé que les oiseaux nourris avec des régimes complétés par des plantes phytogéniques avaient un gain de poids corporel significativement ($p <0,05$) plus élevé, une consommation alimentaire accrue que ceux des régimes non supplémentés et des régimes témoins. Les apports alimentaires plus élevés obtenus dans les régimes supplémentés ont révélé une amélioration de la saveur, du

goût et de l'acceptabilité de l'aliment et une augmentation de l'appétit des oiseaux. Il n'y avait pas de différence significative (p>0,05) dans les paramètres des oiseaux nourris avec le régime témoin (T_1) et le régime (T_2). Les indices hématologiques et biochimiques sériques ont révélé qu'il existait des différences significatives (P<0,05) entre les traitements, à l'exception du nombre de globules blancs où aucune différence significative (P>0,05) n'existait. Les oiseaux nourris avec un régime témoin avaient un taux de cholestérol significativement plus élevé (p<0,05) que ceux nourris avec un régime CRSCT. Le régime à base de mélange de contenu de sang de chèvre dans le rumen complété avec des plantes phytogéniques pourrait être inclus dans les régimes des poulets de chair jusqu'à 10 % de mélange de contenu de sang de chèvre dans le rumen avec 0,5 g/kg de romarin sans aucun effet négatif sur les performances.

Mots-clés : Plante phytogène, Romarin et poulets à griller

Introduction

The high cost of feeds and therefore, the cost of poultry products have made researchers to concentrate on the use of cheaper and locally available alternative agro-by products especially those that have no nutritional value to mankind (Oladunjoye and Ojebiyi, 2010). The need to maximize the economic and environmental disposal of slaughterhouse by-products (NAVN, 1994) also stimulated a renewed interest in the investigation of slaughterhouse by-products for possible use as protein feedstuffs in livestock feeds (Mohammed *et al*., 2011). Incorporation of such products in feed would help in alleviating the problem of the scarcity of feed supply that is having a negative effect on livestock industry most especially monogastric animal production (Onu *et al*., 2011). Phytogenic as feed additive in poultry production is theuse of aromatic plant and plant bioactive compounds dates back thousands of years to the ancient Egyptians, Chinese, Indians and Greeks (Kamel, 2001). Chinese herbal medicines have been used for many centuries for treating various human and animal diseases (Li, 2000). Phytogenic feed additives have attracted increasing interest as an alternative feeding strategy to replace antibiotics growth promoters in recent years. There has been an increased awareness of the potential that natural plant compounds help in the prevention and treatment of poultry disease (Guo *et al*., 2004). The phytogenic feed additives can perform multiple functions in the animal body such as increased feed intake and digestive secretion (Windisch *et al*., 2009). The primary mode of action of phytogenic feed additives arose from beneficially affecting the ecosystem of gastrointestinal microbiota through controlling potential pathogens. The use of phytogenic plants will reduce the use of antibiotic growth promoters (AGPs) in poultry diets (Umit, 2011) due to their antimicrobial properties (Kamel, 2001) by ensuring greater productivity in poultry through increase feed acceptability, nutrient utilization, appetite stimulation, increased flow of gastric juice which gives piquancy to tasteless food (Daizak, 1989). It has been suggested that *Rosemarinus officinalis* can be used as flavor, possesses carminative properties and has a high degree of inhibition against 25 genera of bacteria and fungi (Montes *et al*., 1998). Rosemary (*Rosemarinus officinalis*) contain compounds that have been reported to have antioxidant properties (Lu and FA, 2001). Rosemary is a widely used aromatic and medicinal plant which has been recognized to have antioxidant activity (Carvalho *et al*., 2005). It has been proposed that polyphenols from rosemary may greatly increase the functionality of food in terms

of health and wellness of monogastric (Shahidi and Naczk, 2004). It has been extensively reported that rosemary has antimicrobial properties against a wide range of microorganisms, although there is little information regarding the specificity and efficacy of non-volatile phenolic compounds such as microbicides (Santoyo *et al*., 2005). Rosemary belongs to the Lamiaceae family (Lu and FA, 2001) because it is rich polyphenolic compound. An antioxidant property of rosemary has shown that these aromatic plants have same important biological potentials. Generally, these major components determine the biological properties that can act in synergy or regulate one another (Faixova and Faix, 2008). Rosemary has been concluded to have a natural antioxidant that can prevent undesirable health problems by Aruoma *et al*. (1992). Research shows that there is dearth of information on the influence of the combination of these mixtures in poultry production. This study was aimed at assessing the dietary utilization of processed goat blood rumen content mixture (GBRCM) with phytogenic plant supplementation for broiler chicken production.

Materials and methods

Study location

Source and processing of blood and rumen content mixture

Blood and rumen contents of goats were collected from the main abattoir during slaughtering process. The rumen was disemboweled, and the content was emptied into a 25 litres plastic bucket. The rumen content was mixed with blood collected from the abattoir at a ratio of 3:1. It was boiled for 30minutes with constant stirring and was sun-dried on concrete floor to about 12% moisture.

Experimental diet

Four experimental broiler diets were formulated such that diet I (T_1) contained 0% GBRCM without supplementation (control). Diet 2 (T_2) contained 10% GBRCM without supplementation. Diets T_3 contained 10% GBRCM supplemented with 0.5g rosemary 1kg of feed.

Table 1: Composition of the experimental broiler chicken diets

Ingredients %	Diet 1	Diet 2	Diet 3
Maize	48.00	48.00	48.00
Soyabean meal	22.00	12.00	12.00
Wheat oftal	15.00	15.00	15.00
GBRC	0.00	10.00	10.00
PKC	10.00	10.00	10.00
Fish meal	2.00	2.00	2.00
Bone meal	2.00	2.00	2.00
Lysine	0.25	0.25	0.25
Methonine	0.25	0.25	0.25
Premix	0.25	0.25	0.25
Salt	0.25	0.25	0.25
Total	100.00	100.00	100.00
Rosemary	-	-	-
Calculated Chemical Composition:			
Crude Protein	19.16	18.15	18.15
Total ME/cal.(kg)	3095.79	2985.66	2958.66

Premix supplied (Univit 15 Roche) contained: 15001.U, Vit.A;15001.U, Vit.D;30001.U, Vit.E;3.0g, Vit.K;2.5g, Vit,B2;0.3g, Vit.B6; 8.0mg, Vit.B12;8.0g, Nictinic acid; 3.0, Ca -Panthothenate;5.0mg, Fe;10.0g, Al;0.2g, Cu;3.5mg, Zn;0.15mg, I;0.02g, Cu;0.01g,Sc. GBRCM =Goat blood rumen content mixture.PKC =Palm kernel cake. ME (cal/g) = Metabolizable Energy (calories per kilogramme).

Experimental animal and management of the broiler chicken

One hundred and twenty weeks, one day old chicks of Anak breed were used for this experiment. The birds were allotted to three dietary treatments in a completely randomized design (CRD). The experiment lasted for five weeks.

Collection of blood samples and analysis

Two 2mls of blood was collected from three birds of each replicate via the wing vein.

Statistical analysis

Data were analyzed and subjected to one-wayAnova.

Results and discussions

Proximate composition goat blood-rumen content mixture and rosemary used in the formulation of the experiment diets are shown in Tables 2. Table 3 is the proximate composition of the experimental diets fed to birds. The crude protein values for the broiler chicken diets were within the range of 19 – 20% reported by Oladunjoye and Ojebiyi (2010). The range of ash values obtained in this study was adequate to provide the necessary mineral such as calcium and phosphorus needed for development of bones.

Table 2: Proximate composition goat blood-rumen content mixture and rosemary

Parameter (%)	GBRCM	Rosemary
Dry matter	93.10	78.03
Crude protein	35.00	1.06
Crude fibre	27.96	18.00
Ether Extract	4.32	0.05
Total Ash	13.50	3.40
Nitrogen free extract	48.92	40.01

Table 3: The proximate composition of the experimental diets

GBRCM & Aps (%)	Dry Matter	CrudeProtein	Crude Fibre	Ether Extract	Ash	Metabolizable Energy (Cal/)
0%	92.73	19.18	8.57	8.19	9.10	2889.71
10% GBRCM	92.66	20.38	12.14	9.29	9.50	2910.95
10% GBRCM (rosemary)	92.19	20.88	12.30	9.23	9.38	2925.30

GBRCM & APs = Goat blood-rumen content mixture and Aromatic plants (%) = (percentage), DM = Dry matter, CP = crude protein, CF = Crude fibre, EE = Ether Extract, Ash = Total Ash, ME (CAL/kg) = Metabolizable Energy (calories per kilogram).

Table 4 shows the performance characteristics of broiler chicken fed experimental diet. There were significant ($P<0.05$) differences in all the parameters measured. Diets T_3 significantly ($P<0.05$) improved the weight gain of birds than the control diet. The improved body weight gain obtained in this work strengthened the reports of (Ademola *et al*., 2009) on weight gain of birds fed aromatic plants. Birds on rosemary diet had enhanced ($p<0.05$) feed conversion ratio than other birds.

This observation was similar to that of **Hassan *et al*. (2004) who** reported an improvement in feed conversion ratio by the addition of herbal feed additives in the diets. There were significant ($P<0.05$) improvements in the feed intake of the birds fed diet T_3. The higher feed intake obtained in supplemented diets revealed improved flavor, taste, palatability of the feed and increased appetite of the birds that stimulated feed consumption. These authors reported that the sense of taste is very important in selecting feed by animals. This finding strengthened the earlier reports of Onu and Aja (2011).

Table 4: Performance characteristics of broiler chicken fed experimental diets

Parameters (g)	Diet 1	Diet 2	Diet 3	SEM	SIGN
Initial Body Weights (g)	1252.50[a]	1251.00[a]	1252.00[a]	12.31	*
Final Body Weights (g)	3031.55[b]	3083.33[b]	3325.00[a]	39.36	*
Total Body Weights (g)	1866.50[b]	1880.83[b]	2040.90[a]	31.30	*
Daily Body Weights (g)	53.33[b]	53.74[b]	53.31[a]	0.91	*
Total Feed Intake (g)	4025.00[b]	4027.76[b]	4061.33[a]	17.75	*
Daily Feed Intake (g)	115.00[b]	115.08[b]	116.03[a]	0.51	*
Feed Conversion Ratio	2.16[a]	2.14[a]	2.00[b]	0.03	*

GBRCM =Goat Blood-Rumen Content Mixture, SEM=Standard Error of Mean

Table 5: The effect of aromatic plants on the haematology and serum biochemistryof broiler chicken fed experimental diets

Parameter	Diet1	Diet 2	Diet 3	SEM	SIGN
Haemoglobin conc. (g/100ml)	10.30[b]	11.30[a]	12.00[a]	±0.50	*
Packed Cell volume (%)	34.00[b]	35.00[a]	36.00[a]	±0.84	*
White Blood Cell ($x10^9/_L$)	9.10[a]	9.09[a]	9.07[a]	±0.39	NS
Red Blood Cell ($x10^{12}/_L$)	1.80 [b]	1.90[b]	2.05[a]	±0.25	*
Mean Cell Volume (FL)	115.10[b]	117.00[b]	124.00[a]	±1.22	*
Mean Cell Haemoglobin (Pg)	75.60[b]	79.70[b]	86.70[a]	±1.09	*
Mean Cell Haem. Conc. (g/L)	626.00[c]	667.00[b]	692.00[a]	±2.69	*
Protein (g/L)	37.40[b]	39.80[a]	39.50[a]	±0.57	*
Albumin (g/L)	12.70[b]	13.50[a]	13.05[a]	±0.34	*
Globulin (g/L)	24.70[b]	26.30[a]	26.45[a]	±0.45	*
Urea (mg/dl)	3.00[c]	4.40[b]	5.00[a]	±0.42	*
Creatinin (mg/dl)	0.74[b]	0.90[a]	0.64[a]	±0.22	*
Total cholesterol (mmo/L)	2.90[a]	1.30[b]	1.28[b]	±0.42	*

a,b, c, means with same superscripts along the same row are significantly (P>0.05) the same; But a, b, c, means with different superscripts along the same row are significantly (P<0.05) different, SEM = Standard Error of Means.

The dietary treatments had significant ($p<0.05$) influence on all the haematological indices evaluated except the white blood cell. The higher serum albumin and globulin values of birds fed supplemented and unsupplemented GBRCM diets implied that the proteins of the treatments T_2 – T_3, were readily available to the birds Anon(1980) reported changes in protein reserve in animal as indicated by serum total protein to be associated with alteration in the albumin fraction. Birds fed control diet had significantly higher($p<0.05$) cholesterol level than those fed GBRCM diets. This finding strengthened the reports of Olomu (1995). The results also agreed with those of Fuhrman (2000) that phytogenic plant foods possess cholesterol-suppressive capacity.

Conclusion

The study showed that weight gain/broiler chicken indicated that the birds utilized treatment diets than the control diet T_1. Birds on diet T_3 containing 10% goat blood rumen content mixture with 5g phytogenic plant revealed statistically ($P<0.05$) highest weight gain than others. It also improved the haematological indices and biochemical component. Supplementation of GBRCM with phytogenic plant (rosemary) in diets of broiler chickens enhanced the growth performance, immune response, reduced blood cholesterol and improved health of broiler

chickens. Based on the findings from this study, phytogenic feed additives enhanced broiler performance, promoted weight gain, high quality meat, and improved stock size with cheapest cost. Therefore, recommended for its use in poultry nutrition for more sustainability.

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Received: 12th November, 2021
Accepted: 25th February, 2022