Assessment of goat blood-rumen content as alternative protein source in broiler chicken diets supplemented with aromatic pants

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Abstract

One hundred and twenty, one day old Anak breeds were randomly assigned to five treatment diets. Each group was replicated into four with six birds per replicate. Five experimental diets were formulated with diet 1 (T1) as control, contained 0% Goat Blood-Rumen Content Mixture (GBRCM) and aromatic plants. Diet 2 (T2) contains 10% GBRCM without aromatic plants supplementation. Diet 3, 4 and 5 (T3, T4 and T5) contained 10% goat blood-rumen content mixture supplemented with garlic (Allium sativum), ginger (Zingiber officinale) and rosemary (Rosemarinus officinalis). The experiment lasted for 56 days. Parameters evaluated were; body weight gain, feed intake, feed conversion ratio, protein intake, protein efficiency ratio, nutrient digestibility and economics of production. The results showed that birds fed with aromatic plant supplemented had significantly (P < 0.05) higher body weight gain, feed intake and superior feed conversion ratio than birds fed with unsupplemented and control. There was no significant (P>0.05) difference on the parameters of the birds fed with control diet T1 and T2 among the treatments. Diet T, formulated with 10% goat blood-rumen content and 5 grams of Allium sativum indicated the best performance followed by diet T, and diet T_s. This showed that the goat blood-rumen content based-diet supplemented with aromatic reduced the high cost of feed material, ensured greater productivity and has no adverse effect on health status of the birds. The GBRCM based-diet supplemented in the broiler bird's diets reduced the cost of production with no adverse effect on performance.

Keywords: GBRCM, Protein Source, Broiler Birds, Performance and Superior Feed Conversion

Introduction

Broiler production is more sustainable and has lower environmental impact than other animals' such as cattle, sheep and goat. Broiler production use smaller amount of feed per kilogram of meat produced, and also smaller land and water for both farming and feed production (Flachowsky *et al.*, 2017). Out of the several constraints facing the poultry industry, feed availability remains the most challenging of them in the tropics (Girma *et al.*, 2011). There are some nutritional and technological

considerations, which determine the feasibility of an alternative protein source to be introduced into the diet (Van derPoel et al., 2013). A major source of protein in broiler chicken diets is soybean meal (SBM). The protein quality of goat bloodrumen content compares satisfactorily with soya bean meal. Goat blood-rumen content can enhance growth and reduce the cost of rearing poultry and other monogastrics. Grass contains back-up nutrients such as proteins, vitamins, fibre and compounds like omega-3 fatty acid to prevent any

deficiencies of feed from affecting the chickens (The Poultry Site, 2013). The effective use of this viable alternative protein source can reduce feed costs; improve the stock size and number of chicken sold. Hence, this study was designed to assess goat blood-rumen content as an alternative protein source for poultry sector and other monogastrics.

Materials and methods

Experimental site or location

The research was carried out at the Teaching and Research Farm (Poultry Unit) of the Department of Animal Science, Ebonyi State University, Abakaliki, Ebonyi State Nigeria.

Source of goat blood-rumen content mixture and processing method

Goat blood-rumen content was collected from the main abattoir at Igboji market in Ebonyi State, Nigeria. The rumen was split open with the aid of sharp knife and the content was emptied into a 25 litres plastic bucket. The rumen content was mixed with blood collected at the ratio of 3:1. It was poured into a pot and boiled for 30minutes, sun-dried on concrete floor for about 12% moisture and was stored for mixing with other feed ingredients.

Table 1: Proximate composition of feed ingredients

Parameter (%)	GBRCM
Dry matter	93.10
Crude protein	35.00
Crude fibre	27.96
Ether Extract	4.32
Total Ash	13.50
Nitrogen free extract	48.92

Experimental diet

The goat blood-rumen content mixture so processed in this experiment was used to formulate five experimental finisher diets such that diet I (T₁) contained 0% GBRCM without supplementation (control). Diet 2 (T₂) contained 10% GBRCM without supplementation. Diets T₃, T₄ and T₅ contained 10% GBRCM supplemented with 5g garlic, ginger and rosemary per 1kg of feed respectively.

Experimental animal and management of the broiler chicken

One hundred and twenty day old chicks were used for this experiment. Each bird was weighed before the commencement of the experiment and weekly throughout the experiment period. The birds were randomly allotted to five (5) dietary treatments in a completely randomized design (CRD). Other poultry management practices were maintained and the experiment lasted for five (8) weeks

(56days).

Statistical analysis

All data obtained were statistically analyzed Collection of blood samples and analysis

Blood (2mLs) was collected from three birds of each replicate via wing vein. Samples collected were put in a sterile bottle tube containing Ethylene Diaminetetra-acetic acid (EDTA) as anticoagulant to prevent blood clothing before the analysis. Packed cell volume (PCV) and erythrocyte counts were determine as described by Ewuola and Egbunike, (2008). Analysis to be obtained serum albumin, protein, urea, and creatinin were analyzed using sigma kits according to Feteris, (1965) total cholesterol was determined spectrophotometrically.

Results and discussions

The results of the proximate composition of feed ingredients is shown in Table 3. The results showed that the dry matter, crude

Table 2: Ingredients Composition of the Experimental Broiler Finisher diets

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Ingredients %	T_1	T_2	T ₃	T ₄	T ₅			
Maize	48	48	48	48	48			
Soyabean meal	22	12	12	12	12			
Wheat oftal	15	15	15	15	15			
GBRCM	00	10	10	10	10			
PKC	10	10	10	10	10			
Fish meal	2	2	2	2	2			
Bone meal	2	2	2	2	2			
Lysine	0.25	0.25	0.25	0.25	0.25			
Methonine	0.25	0.25	0.25	0.25	0.25			
Premix	0.25	0.25	0.25	0.25	0.25			
Salt	0.25	0.25	0.25	0.25	0.25			
Total	100	100	100	100	100			
Calculated Chemical								
Composition:								
Crude Protein	19.16	18.15	18.15	18.15	18.15			
Total ME/cal.(kg)	309579	298566	295866	295866	295866			

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).

protein, and ash content of unsupplemented and supplemented GBRCM diets compared favourably with the control. However, they have higher crude fibre and ether extract values than the control diet but lower in metabolizable energy content. The nutrient content of the unsupplemented diets (T_2) and the supplemented (T_3, T_4) and T₅) were similar. The disparity in nutrient composition may be due the type, chemical composition and stage of growth of grass consumed by the animals and the proportion of the constituent mixtures. This could also be influenced by the period of fasting prior to slaughter and stage of digesta degradation in the rumen (Onu et

al., 2011). The high crude protein value of GBRCM suggests its utilization as a protein supplement in diets for broilers. As shown in Table 4, Ginger, garlic and rosemary supplementation of the diets significantly (P<0.05) improved the weight gain of birds than the control diet. There was no significant (P>0.05) difference in the weight gain of broilers fed the control (T₁) and unsupplemented (T_2) diets. The improved growth of broiler chicks may have emanated from enhanced digestion of food nutrients and probably improved food absorption through the wall of gastrointestinal tract (Ademola et al., 2005). This finding strengthened the earlier reports of Onu et al. (2011).

Table 3: Proximate composition of experimental diets

Treatment (%) GBRCM &	DM	CP	CF	EE	ASH	ME(Cal/g)
APs						
0%	92.73	19.18	8.57	8.19	9.10	2625.30
10% GBRCM	92.66	20.38	12.14	9.29	9.50	2580.95
10% GBRCM (garlic)	92.16	20.81	12.29	9.42	9.49	2589.87
10% GBRCM (ginger)	92.58	20.19	12.38	9.33	9.44	2597.99
10% GBRCM (rosemary)	92.19	20.88	12.30	9.23	9.38	2589.71

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). DM = Dry Matter, CP = Crude Protein, Cf = Crude Fibre, EE = Ether Extract, Ash = Total Ash, GBRCM = Goat Blood —Rumen Content Mixture and ME (cal/kg) = Metabolizable Energy (calories per kilogramme). The Proximate Composition of Experimental diets

Assessment of goat blood-rumen content as alternative protein source in broiler chicken

Table 4: Performance characteristics of broiler finishers fed experimental diets

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Parameters (g)	$T_1(0\%)$	T_2 (10%)	T ₃ 10%	T ₄ 10%	T ₅ 10%	SEM	SIGN	
		GBRCM	GBRCM	GBRCM	GBRCM	<u>(+)</u>		
			(0.5%	(0.5%	(0.5%			
			garlic)	ginger)	rosemary)			
Initial Body Weights (g)	1252.50 ^b	1250.00 ^b	1297.50 ^a	1267.50 ^a	1260.00 ^a	12.31	*	
Final Body Weights (g)	3031.55 ^b	3083.33 ^b	3358.33 ^a	3335.42a	3325.00 ^a	39.36	*	
Total Body Weights (g)	1866.50 ^b	1880.83 ^b	2064.58a	2041.67a	2040.90a	31.30	*	
Daily Body Weights (g)	53.33 ^b	53.74 ^b	59.49 ^a	58.33 ^a	53.31a	0.91	*	
Total Feed Intake (g)	4025.00^{b}	4027.76 ^b	4156.66a	4072.08 ^b	4061.33 ^b	17.75	*	
Daily Feed Intake (g)	115.00 ^b	115.08 ^b	118.76 ^a	116.35 ^b	116.03 ^b	0.51	*	
Feed Conversion Ratio	2.16^{a}	2.14^{a}	2.00^{b}	2.07^{b}	2.00^{b}	0.03	*	
Daily Protein Intake	22.03a	20.89^{c}	21.56 ^b	21.12°	21.22 ^b	0.12	*	
Protein Efficiency Ratio	2.42^{b}	2.57^{b}	2.66^{a}	2.76^{a}	2.75 ^a	0.04	*	
Mortality	0.00	0.00	0.00	0.00	0.00			
	-							

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

The Effect of aromatic plants supplemented goat blood-rumen content mixture on the nutrient digestibility of broiler finishers is presented in Table 5. The effect of the experimental diets on the nutrient digestibility were significantly (P<0.05) different among the treatments. The dry matter and crude protein digestibility were significantly (P<0.05) higher in birds fed unsupplemented (T2) and supplemented (T₃, T₄ and T₅) GBRCM diets than those on control (T₁) diet. There was no significant (P>0.05) difference in dry matter and crude protein digestibility of birds fed unsupplemented (T2,) and supplemented $(T_3, T_4 \text{ and } T_5)$ GBRCM diets. Birds fed the control (T₁) and unsupplemented GBRCM (T₂) diets recorded significantly (P<0.05)

higher crude fibre and ether extract digestibility than birds fed supplemented $(T_3, T_4, and T_5)$ diets. The comparable dry matter, crude protein and total ash of birds fed supplemented and unsupplemented goat blood-rumen content mixture diets suggest adequate crude fibre level of the diet which had no adverse effect on nutrient digestibility of the birds. This may be attributed to effective utilization of the nutrient as a result of tolerable fibre content of the diet. This is in disagreement with the report of Mohammed et al. (2016) that linked the low digestibility values for bovine rumen content to its high fibre content. The disparity in these findings may be due to the level of inclusion of this fibrous material.

Table 5: The Nutrient Digestibility of Experimental Diets Fed Broiler Finishers

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Parameters	0%	10%	10%	10%	10%	SEM	
Measured%		GBRCM	GBRCM	GBRCM	GBRCM	<u>+</u>	
			Garlic	Ginger	Rosemary		
Dry Matter	67.67 ^b	72.09 ^a	72.78 ^a	71.80 ^a	72.01 ^a	0.50	
Crude protein	67.66 ^b	70.23 ^a	70.31a	70.38a	70.34^{a}	0.30	
Crude Fibre	73.10 ^a	73.91a	71.53 ^b	71.86 ^b	72.05^{b}	0.89	
Ether Extract	74.62^{a}	74.32a	73.22 ^b	73.57^{b}	73.70^{b}	0.16	
Total Ash	94.07^{b}	95.47 ^a	95.41 ^a	94.60 ^b	95.00^{a}	0.16	

GBRCM = Goat Blood Rumen Content Mixture SEM = Standard Error Mean

a, b, c, means within rows with different superscripts were significantly (P<0.05) different.

The result of the economics of production of broiler finisher

Present results are in agreement with the report of Apata and Ojo (2000) that the high cost of feed was largely due to the exorbitant price and scarcity of conventional ingredient and that this could

be lowered by using non-conventional feed ingredients. The higher weight gain and better feed efficiency of the supplemented diets are two major possible influences which resulted in increased cost saving and consequent increased profitability of the birds fed these diets.

Table 6: Economics of production of broiler finisher

Parameters (N)	$T_1 \mathbb{N}$	T₂₩	T ₃ ₩	T₄₩	T₅ N
Cost of feed per kilogramme (N)	63.22	46.02	46.82	47.02	47.02
Total Daily Feed Intake (g)	115.00	115.08	118.76	116.35	116.03
Cost of feed consumed (₦)	254.45	185.50	192.00	191.45	191.60
Total Body Weight Gain (g)	1866.50	1880.83	2064.58	2041.67	2040.90
Cost of feed per kilogramme Body					
Weight Gain (₩)	474.93	377.65	396.40	390.88	391.04
Cost savings (%)	-	97.28	78.53	84.05	83.89

Conclusion

Supplementation of GBRCM based-diets enhanced the performance, reduced blood cholesterol, improved health of chicken and reduced cost efficiency of broiler rearing. The goat blood-rumen content can be included in broilers diets up to 10% without any adverse effects on growth performance and health of broilers. Since it could be obtained at little or no cost, its inclusion in broilers rations will significantly reduce the cost of production it could be increased to 20%.

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