EFFECTS OF REPLACING WHEAT OFFAL WITH COWPEA TESTA ON THE PERFORMANCE AND ECONOMIC ANALYSIS OF BROILER CHICKENS

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ABSTRACT

The effects of replacing wheat offal with cowpea testa was investigated using one hundred and fifty one week-old broiler chickens for a period of 9 weeks. The chickens were randomly divided into 5 dietary treatments in groups of 30 chickens and replicated 3 times with 10 chickens per replicate in a Randomized Complete Block Design (RCBD). Broiler starter and finisher diets were compounded and cowpea testa was used to replace wheat offal at graded levels of 0%, 25%, 50%, 75% and 100%. Results obtained indicated no significant (P>0.05) difference in all the parameters. The economic analysis revealed that the feed cost (₦/kg) decreased with increasing levels of cowpea testa in the diets while, no significant (P>0.05) difference was recorded on the feed cost per weight gain (₦/kg gain). However, there was a corresponding improvement in savings in the overall cost of production at 25% cowpea testa diet. Cowpea testa could therefore replace wheat offal at 25% of the wheat offal in broiler diets and thus recommended in areas where the cost of wheat offal is high and supply inadequate.

Keywords: Wheat offal, cowpea testa, broiler chickens, performance, economic analysis

INTRODUCTION

Feed remains one of the most important single input in poultry enterprise, accounting for 60 – 70% of the total cost of commercial poultry production (Olajide, 2010). The utilization of un-conventional feed resources could be an alternative for expanding the feed resource base for poultry, because they are less expensive than the conventional ones. Agro-industrial by-products (AIBs) have in recent times formed the focus of research in animal nutrition especially for monogastrics and their use as un-conventional feed sources has offered opportunities in alleviating the problems associated with animal feed supply (Babatunde, 1989). However, there are limitations when some of the various products such as rice husk or bambara nut waste are fed to poultry. Problems associated with digestion and absorption of nutrients has been noted due to high fibre concentration (Ani, 2007).

Agro-industrial by-product such as wheat offal is in high demand, making the product expensive. There is therefore, a need to explore cheaper alternative such as cowpea testa. Cowpea testa contains 17% crude protein, 2.6% ether extract, 20.3% crude fibre and 1005 kcal/kg of metabolizable energy (Sonaiya, 1993). This implies that cowpea testa is comparable with other un-conventional feedstuff. Cowpea testa is cheap and available where cowpea production is abundant. The objective of this study was to investigate the productive and economic performance of broiler chickens fed cowpea testa as a replacement for wheat offal.

MATERIALS AND METHODS

Study Area. The study was carried out at the poultry unit of Livestock Teaching and Research Farm, Department of Animal Production, Adamawa State University, Mubi. Mubi is located between latitude 9°30' and 11°N of the equator and longititude 13° and 13°45'E of the Greenwich meridian and lies in Guinea savannah zone of Nigeria. The rainfall starts in April and ends in October. It has an annual rainfall of about 750 mm to 1100 mm per annum with temperature ranges between 15.2°C and 39°C (Adebayo and Tukur, 1999) .

Experimental Diets. The experimental diets contained cowpea testa which was dried and ground into meal. The cowpea testa meals (CTM) were used to replace wheat offal (WO) at 0%, 25%, 50%, 75% and 100% levels in the diets. Composition of the experimental diets is presented in Table 1.

Experimental Design. A total of one hundred and fifty (150) day-old chicks were randomly assigned to five (Adebayo and Tukur, 1999) treatment diets. Each treatment consists of three (Ani, 2007) replicates of ten (Akinfala *et al.*, 2013) chickens in a Randomized Complete Block Design (RCBD).
Experimental Stock and Management. The chicks were purchased from ECWA hatchery Jos, Plateau State and used for the study. The chicks were brooded for seven (Pauzenga, 1985) days and allotted to treatment group / diets. Standard management practices and vaccination schedule were carried out. Experimental diets and adequate drinking water were provided *ad libitum* throughout the experimental period. The experiment lasted for nine (Oluyemi and Roberts, 2000) weeks.

Chemical Analysis: Proximate composition of the feed ingredients was analyzed using AOAC (2004) methods. The energy values of the feeds were calculated using the formula of Pauzenga (1985) expressed as:
ME (kcal/kg) = 37 x %CP + 81 x % EE + 35.5 x % NFE.

Statistical Analysis: Data collected were analyzed using statistical package (Statistix 9.0 version). Least significant difference (LSD) was used to separate the means where significant differences ($p<0.05$) occurred.

Table 1. Composition (%) and Calculated Analysis of the Experimental Broiler Starter and Finisher Diets

		Replacement Levels of Wheat Offal with Cowpea Testa				
Ingredient		**0%**	**25%**	**50%**	**75%**	**100%**
Maize	S	44.55	44.55	44.55	44.55	44.55
	F	50.61	50.61	50.61	50.61	50.61
SBM	S	30.45	30.45	30.45	30.45	30.45
	F	24.39	24.39	24.39	24.39	24.39
Fish meal	S	5.00	5.00	5.00	5.00	5.00
	F	5.00	5.00	5.00	5.00	5.00
Wheat offal	S	16.00	12.00	8.00	4.00	0.00
	F	16.00	12.00	8.00	4.00	0.00
Cowpea testa	S	0.00	4.00	8.00	12.00	16.00
	F	0.00	4.00	8.00	12.00	16.00
Bone meal	S	2.50	2.50	2.50	2.50	2.50
	F	2.50	2.50	2.50	2.50	2.50
Salt	S	1.25	1.25	1.25	1.25	1.25
	F	1.25	1.25	1.25	1.25	1.25
Vitamin Premix	S	0.25	0.25	0.25	0.25	0.25
	F	0.25	0.25	0.25	0.25	0.25
Total		**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated Analysis (%)						
Crude protein	S	22.00	22.08	22.16	22.24	22.32
	F	20.00	20.08	20.16	20.24	20.32
Crude fibre	S	3.97	4.44	4.91	5.30	5.65
	F	3.76	4.23	4.70	5.18	5.65
Ether extract	S	4.06	4.07	3.99	3.85	3.92
	F	4.01	3.97	3.94	3.90	3.87
Calcium	S	1.32	1.67	2.03	2.39	2.74
	F	1.32	1.67	2.02	2.38	2.74
Phosphorus	S	0.77	0.08	0.82	0.84	0.86
	F	0.75	0.78	0.80	0.82	0.84
ME (kcal/kg)	S	2900.85	2866.85	2831.85	2797.25	2762.65
	F	2919.03	2884.43	2849.83	2815.23	2780.76

SBM: Soyabean meal, ME: Metabolizable energy, S = Starter, F = Finisher

Results and Discussion

The proximate composition of the experimental diet at starter and finisher phases were presented in Table 2. Result obtained showed that the dry matter ranged from 96.70% to 97.20% and 94.80% to 95.40% for starter and finisher diets, respectively. The crude protein levels of 20.10 to 23.00% and 17.20% to 20.50% for starter and finisher diets, respectively were obtained. The crude protein contents increased with increasing level of cowpea testa in the diets. Similarly, the ether extract levels increased with increasing level of cowpea testa. The ash followed similar trend and levels of nitrogen-free extract recorded in this study were 47.70% to 55.60% and 51.10% to 60.90% for starter and finisher diets, respectively. The values of crude protein obtained in this study were within the recommended values of 18 to 24% reported by (Olomu, 2011) for broiler chickens at nine (Oluyemi and Roberts, 2000) weeks of age.

Result of the growth and economic performance is presented in Table 3. There were no significant ($p>0.05$) difference in final weights, daily feed intake, and daily weight gain. Feed conversion ratio followed the same trend. The result of mortality showed that 6.67% of the chickens died during the experimental period which was within the recommended mortality rate for broiler chickens (Oluyemi and Roberts, 2000).

Result of economic analysis showed that, the total feed cost ranged from ₦1026.65 to ₦1974.42. The total weight (₦/kg) gain recorded were ₦1947.16 to ₦2017.26. The feed cost (₦/ kg) decreased from ₦168.55 to ₦176.55 as level of cowpea testa increased. The feed cost /kg gain was drastically reduced (₦518.47) at 25% level of cowpea testa inclusion. The analysis revealed that at 25% replacement level of wheat offal by cowpea testa, the feed cost decreased from ₦176.55 to ₦168.55/kg. If the total feed cost contributes 60 to 70% cost of poultry production according to (Olajide, 2010), 5% decrease is appreciable in order to boost the profitability of broiler enterprise when using non-conventional feed ingredients. The cost of total feed intake was relatively higher (₦1957.41) at 75% replacement level and lower (₦1026.55) at 25%. This was probably as a result of enhanced feed intake by the broiler chickens as the level of cowpea testa increases. The results of cost benefit analysis obtained in this study were in line with Akinfala *et al.* (2013) and Kwari *et al.* (2012) who used varied non-conventional fibre sources in poultry diets.

Table 2. Proximate Composition of the Experimental Broiler Starter and Finisher Diets

	Replacement Levels of Wheat Offal with Cowpea Testa				
Parameter	**0%**	**25%**	**50%**	**75%**	**100%**
Starter Diets					
Dry matter	97.00	96.70	96.80	96.70	97.20
Crude protein (%)	20.10	20.60	21.80	22.70	23.00
Crude fibre (%)	7.80	8.00	8.20	8.70	9.20
Ether extract (%)	8.00	8.20	8.50	9.20	9.30
Ash (%)	5.50	7.00	7.80	7.80	8.00
NFE (%)	55.60	52.90	51.50	48.50	47.70
Finisher Diets					
Dry matter (%)	95.40	95.00	94.80	94.70	95.00
Crude protein (%)	17.20	17.90	18.70	19.80	20.50
Crude fibre (%)	6.40	7.20	7.60	8.20	9.00
Ether extract (%)	4.20	4.90	5.70	6.30	6.80
Ash (%)	6.70	6.80	7.20	7.40	7.60
NFE (%)	60.90	58.60	55.60	53.00	51.10

NFE = Nitrogen-Free Extract.

Table 3. Growth and Economic Performance of Broiler Chickens fed Varying Levels of Cowpea Testa Meal as Replacement for Wheat offal

	Replacement Levels of Wheat Offal with Cowpea Testa					
Parameters	**0%**	**25%**	**50%**	**75%**	**100%**	**SEM**
Initial wt. (g/bird)	100.67	100.00	101.67	100.00	100.00	3.93^{NS}
Final wt. (g/bird)	2065.00	1945.00	1990.00	1873.33	1920.00	80.67^{NS}
Daily feed intake (g/bird)	98.56	93.35	110.14	98.93	103.54	3.35^{NS}
Daily wt. gain (g/bird)	32.02	31.58	31.34	31.07	29.32	0.39^{NS}
Total feed intake (g)	6209.28	5881.05	6938.82	6231.33	6873.47	-
Total feed intake (kg)	6.21	5.88	6.34	6.23	6.88	NAS
FCR (feed: gain)	3.07	2.97	3.58	3.19	3.58	0.28^{NS}
Total wt. gain (g)	2017.26	1989.54	1974.42	1957.41	1847.16	-
Total wt. gain (kg)	2.01	1.20	1.97	1.96	1.85	NAS
Feed cost (₦/kg)	176.55	174.51	172.57	170.55	168.55	NAS
Feed cost / kg gain (₦/kg)	543.18	518.47	620.67	544.65	602.8	46.04^{NS}
Mortality	1.00	2.00	2.00	3.00	2.00	-

SEM = Standard Error of Means, NS = Not significant (p>0.05), FCR = Feed Conversion ratio, NAS = Not Analyzed Statistically

CONCLUSION AND RECOMMENDATIONS

Cowpea testa diets can favourably replace wheat offal in the diets of broiler chickens without adverse effects on performance. Cowpea testa was readily available and cheaper than wheat offal in the study area. The economy of poultry production using 25% level of cowpea testa to replace wheat offal was more rewarding in terms of financial benefits especially the feed cost per / kg gain. Farmers should be encouraged to use cowpea testa to replace wheat offal in areas where wheat offal is scarce and costly. More study should be carried out to explore other non-conventional feed resources for feeding poultry.

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