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Effect of Supplementing Fungi-Degraded Cowpea Seed hull in Broiler Diets

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INTRODUCTION

A large percentage of Nigerians live below poverty line resulting in widespread diseases with the attendant reduction in productive capacity. Imperative in meeting the Millenium Development Goals is a need for increased livestock production and consequent intake of animal protein to alleviate the prevailing shortage of protein intake by Nigerians.

Realizing these needs, efforts are being made to increase animal protein production from beef and poultry with the use of various agro-industrial wastes, including those of carbohydrate residues as animal feed. Although crop residues are found in many rural parts of Nigeria, their potential for animal feeding has not been often not fully exploited. This has important consequences because they form a significant part of animal feed. In either case, its value is diminished if it is not adequately fed. It is possible to increase the nutritive value of some of these residues, thus improving livestock productivity.

MATERIALS AND METHODS

The biodegradation of cowpea seed hull was carried out in the Biotechnology Unit of the Department of Animal Science, University of Ibadan, Nigeria. The fungus (*Aspergillus niger*) was collected from the culture bank of the Department of Botany and Microbiology and kept on Potato dextrose agar (PDA) of 28°C, sub cultured every two weeks to ensure viability and active growth. The sterilization and incubation of samples were carried out using the procedure of Onilude (1996).

FEEDING AND MANAGEMENT OF BIRDS

One hundred and twenty day-old broiler chicks were used for the study. Twenty four chicks were assigned to each dietary treatment, which was replicated four times with six birds per replicate. The chicks were reared in deep litter with feed and water supplied *ad-libitum*. The management of the birds was as outlined by Oluyemi and Robert (1979).

SAMPLE COLLECTION AND CHEMICAL ANALYSIS

During the last week of experimental period, two birds from each replicate of four per treatment whose weights were close to the mean, were selected for metabolic trial. Blood was collected from two birds per replicate at the starter and finisher phases into sterile sample tubes without anticoagulant. Serum protein and albumin were analyzed using sigma assay kits, glucose by the method of Cooper and McDaniel (1970) and cholesterol by the method of Roschlan *et al.*, (1974). The globulin concentration was obtained by subtracting albumin from the total protein while albumin/globulin ratio was obtained as described by Peters et al., (1982).

All data collected were subjected to analysis of variance and means separated using Duncan Multiple Range Test (SAS, 1999).

Table 1: Gross composition of experimental diet for broiler starter (g/100g)

	DIETARY TREATMENTS				
INGREDIENT (%)	A (0%)	B (5%)	C (10%)	D(15%)	E 20%)
Maize	56.50	54.20	51.85	49.51	47.16
Groundnut cake	19.00	19.00	19.00	19.00	19.00
Soyabean meal	18.00	18.00	18.00	18.00	18.00
Fishmeal (72%)	2.00	2.00	2.00	2.00	2.00
Oyster shell	2.25	2.25	2.25	2.25	2.25
Bone meal	1.25	1.25	1.25	1.25	1.25
Broiler Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10
Degraded seed hull	-	5	10	15	20
Calculated nutrients					
Crude Protein (%)	23.20	23.23	23.25	23.27	23.29
Crude fibre (%)	3.27	3.99	4.71	5.43	6.15
Metabolisable Energy (Kcal/kg)	2985.01	2987.77	2988.81	2989.93	2990.9

RESULTS AND DISCUSSION

The performance data of broilers fed diets containing different levels of *A. niger*-fermented seedhulls at different phases are presented in Tables 2. No significant difference was observed in the weight gain by birds fed control diet (101.83 g/bird), 10% inclusion, (108.00 g/bird) and 15% inclusion, (106.48 g/bird/week); however, birds fed 20% inclusion had the least weight gain. Weekly feed intake was highest with birds on 20% inclusion (261.67g/bird) followed by those on 5% inclusion, (258.33 g/bird) and the least was observed with birds fed control diet, (228.34 g/bird). The decrease in the weekly weight gain observed with 20% inclusion could be as a result of the increase in the crude fibre content of the feed (6.13%) which was slightly above the NRC(1984) recommended value of 2-5% for broilers.

Feed Conversion Ratio (FCR) was also observed to be poorest in birds on 20% inclusion and this could be attributed to the presence of β-glucan and xylans in the seed hulls of legumes (Choct 1997). The β-glucan and xylåns have been reported to bring about very low viscous condition in the small intestine of birds whereby they interfere with nutrient absorption (Graham and Petterson 1989; Onilude and Osho 1999). The situation was however different with the finisher broilers which showed a significant ($p<0.05$) improvement in FCR compared with the starter birds. This was probably as a result of better fibre utilization with increase in the age of birds as reported by Onilude and Osho (1999).

Table 2: Performance characteristics of starter broiler birds fed supplemented diets containing different levels of *Aspergillus niger* degraded cowpea seedhull

Parameters	A (0%)	B (5%)	C (10%)	D (15%)	E (20%)	r	SEM
	DIETARY TREATMENTS						
Initial Weight (g/bird)	104.50 (410.00)	103.50 (470.00)	110.00 (430.00)	110.00 (430.00)	100.00 (400.00)		
Final Weight (g/bird/)	410.00^b (1675.00^e)	470.00^a (2125.00^a)	430.00^{ab} (1815.00^d)	430.00^{ab} (1950.0^c)	400.00^b (2025.00^b)	-0.35 (0.47)	3.32 (4.05)
Weight gain (g/bird/week)	101.83^{ab} (316.25^d)	122.16^a (413.75^a)	108.15^{ab} (392.50^c)	106.48^{ab} (380.00^c)	98.17^b (406.25^b)	- 0.40 (0.60)	3.20 (5.20)
Feed intake (g/bird/week)	228.34^b (715.83^c)	258.33^a (729.03^c)	253.17^{ab} (720.00^c)	253.33^{ab} (759.03^b)	261.67^a (809.33^a)	0.74 (0.88)	5.10 (3.07)
Feed Conversion Ratio	2.24^c (2.25^a)	2.11^c (1.76^b)	2.34^a (1.92^{ab})	2.38^b (1.99^{ab})	2.69^a (2.00^{ab})	0.86 (0.24)	0.16 (0.12)

abc… means on the same row with the different superscript are significantly different p<0.05)
r ……Correlation factor: SEM… Standard Error of means
……. Values in the parenthesis are values for the finishing phase

In the finisher birds, apparent nutrient digestibilities were better in all diets supplemented with fermented seed hull compared with the control. This was because during fungi fermentation, enzymes were produced which gave synergistic effect leading to better utilization of nutrient (Zyla *et al.*, 1999). Similar reports have been made with diets supplemented with Carbohydrase which gave improvement in the absorption and deposition of vitamins and fatty acids in chicken tissue and egg (Danickle, 2001 and Maisonnier *et al.*, 2001a).

An improvement in Serum Total Protein (TP) of finisher birds over the starters was observed for the entire dietary group (Tables 3). This is in agreement with the work of Ross *et al.*, (1978) who also observed an increase in Serum Total Protein as the birds grew older. The increase in Serum Glucose with increase in degraded seed hull inclusion could be due to an increase in fibre breakdown which according to IFST (2001), caused an increase in glucose metabolism and insulin response. As the inclusion levels of degraded seed hull in the diets increased, more of the polysaccharides were available to the birds thus increasing glucose concentration in the serum.

CONCLUSION

It can be concluded therefore that supplementing the diet of broiler birds with *A. niger* degraded cowpea seedhull at the finisher phase gave better feed utilization than at the starter phase, with no adverse effect on the kidney and liver of the birds.

Table 3: Serum biochemical parameters of broilers fed supplemented diets containing different levels of *Aspergillus niger* degraded cowpea seedhull (Starter Phase)

Parameters	DIETARY TREATMENTS A (0%)	B (5%)	C (10%)	D (15%)	E (20%)	SEM
Total Protein (mg/100ml)	4.47	4.74	5.28	5.15	4.73	0.28
Albumin (mg/100ml)	1.81 [d]	2.30 [c]	2.98 [a]	2.34 [c]	2.59 [b]	0.15
Globulin (mg/100ml)	2.66	2.43	2.30	2.81	2.13	0.28
Albumin:Globulin	0.68 [d]	0.97 [b]	1.33 [a]	0.83 [c]	1.25 [a]	0.18
Glucose (mg/100ml)	122.75 [c]	130.35 [c]	143.75 [b]	143.55 [b]	163.40 [a]	2.98
Cholesterol (mg/100ml)	74.95 [b]	88.93 [a]	85.51 [a]	82.82 [a]	73.59 [b]	1.84

Abc = means on the same row with the different superscript are significantly different p<0.05); SEM = Standard Error of Means

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