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Evaluation of Dietary Inclusion of Sweet Potato (Ipoma Batatas) Leaf Meal (SPLM) with and Without Enzyme Treatment in Broiler Diets

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Abstract: An experiment was conducted to test the effects of Sweet Potato Leaf Meal (SPLM) as a supplement in broiler diet with or without enzyme treatment. This study is a part of ongoing efforts to reduce feed costs in broiler production and thus make more animal protein available and affordable to the growing world population especially in those countries where there are dangerous deficiency gaps between the quantity of animal protein required and the quantity consumed. Five hundred day-old broilers were brooded for four weeks after which 135 birds were selected for the experiment. Data were collected on the body weight and body weight gains, feed intake and feed conversion ratio and costs of feeds per kilogram of body weight of broilers. The data were subjected to both statistical and economic analysis. The results obtained from the analysis revealed that the birds fed with diets containing 20% enzyme treated SPLM proved superior in all parameters evaluated. Based on these observation the study recommended that farmers should be encouraged to include 20% SPLM treated with enzyme in their feed formulation for improved broiler production.

Key words: Evaluation, sweet potato leaf meal, enzyme treatment

INTRODUCTION

The principal material problem facing the poultry industry today, particularly the broiler production, remains the high costs of poultry feeds resulting from the soaring costs of grains. (Mmereole, 1996; Mmereole, 2008) The grains are known to constitute 60-70% of the poultry feeds. (Ekenyem, 2007). The high costs of grains are due to the competition for grains between livestock feeds and other large scale demands such as for human consumption and industrial uses as in the case of breweries and confectionaries. Presently, most of the poultry farms dotted all over Nigeria and some other Low-income, Food Deficit Countries (LIFDC) have shut down due to high costs of poultry feeds (Ekenyem, 2007), thereby escalating the animal protein deficiency crisis existing in such countries (Sonnaiya, 1997).

If poultry production must improve and the growth sustained, alternative energy resources which must be cheap, abundant and not in competition with other large scale demands, must be sourced. In the past decades, studies have been carried out to identify alternative and non-conventional feed resources which are cheap and easily available for poultry production (Aduku, 1993; Esonu *et al*., 2003; Ekenyem, 2007). Recently attention has been drawn to Sweet Potato leaves as alternative energy source for livestock feeds. The plant is mainly cultivated for its edible root while the leaves are discarded as waste, at least until recently. However, in some parts of Africa, limited amounts of the leaves are utilized as vegetables for human consumption. In recent times, however studies have been carried out to establish leaf utilities of certain browse plants as livestock feeds. These studies have been limited mainly to the ruminant nutrition. Okagbare *et al*. (2004) compared the use of certain plant leaves in the diet of goats and concluded that such browse leaves as *Parkia filicoidea*, *Tephrosia braceteolata* and *Gmelina arborea* have great potential in livestock feeding.

Esonu *et al*. (2003) investigated the effect of leaves of *Microdesmis puberula* as a supplement in broiler diet and observed that at lower level of supplementation (5-10%) performance characteristics were not affected but these parameters declined as the level of leaf meal supplementation increased beyond 10% ($P<0.05$). Beyond this level of substitution, significant differences ($p<0.05$) between the two treatments were observed with respect to feed conversion ratio, protein efficiency ratio and feed costs/kg weight gain. They therefore concluded that the leaf meal of *Microdesimis puberula* included in small quantities could be tolerated by the broiler chicken and therefore suggested that if the leaf meal could be treated with exogenous enzyme, it is possible to use it to substitute maize beyond 10% level. The use of exogenous enzyme is very necessary in broiler chickens because their gastro-intestinal apparatus is not equipped to handle high fibre feed ingredients.

In the past, enzyme supplement of poultry diets based on corn/soya bean meals showed little improvement in broiler performance and nutrient digestibility. However, Marsinaan *et al*. (1997) observed that as Non Starch Polysaccharide (NSP) polymers increased in the diet of broilers, the improvement in broiler performance due to enzyme treatment becomes more significant. However, Grimmes *et al*. (1997) carried out an investigation on the effect of enzyme treatment of broiler diets predominantly formulated with high fiber ingredient that are known to

contain high NSP and observed that the birds fed diets treated with enzyme performed better than the birds fed diets without enzyme treatment with respect to body weight gains and feed conversion ratios. It has been shown that enzyme treatments of other high fiber feed ingredients improved the utilization and feed efficiencies of such feed ingredients (Ani and Omeje, 2007). The purpose of this investigation is not to only evaluate the dietary relevance of Sweet Potato Leaf Meal (SPLM) as a replacement for maize in the broiler diets but also to establish a higher level inclusion of SPLM when treated with enzyme. It is expected that the results arising from this investigation will help the farmers cut down the quantity of grains used in broiler diets thus bringing down the feed costs and boasting poultry production again.

MATERIALS AND METHODS

The experiment was conducted at the Teaching and Research Farm of the Department of Animal Science, Delta State University, Asaba Campus, Asaba, Delta State of Nigeria. A total of 500 ANAK day old broiler chicks was brooded for 4 weeks after which 135 birds were randomly selected for the feed trial studies. The feed trials were divided into 3 experimental units while each unit was replicated thrice. The birds were randomly distributed into 3 experimental units and three replicates. Each experimental unit contained 45 birds made up of 3 replicates of 15 birds each. The design of the experiment was a Completely Randomized Design (CRD) as shown in Fig. 1.

The birds were subjected to standard broiler management procedure. The diets used in the experiment and the nutrient analysis of SPLM are presented on Table 1.

At the beginning of the experiment, the initial weights of the birds were taken and subsequent body weights were taken weekly. The data collected during the experiment included weekly body weights and body weight gains, average weekly feed consumption, Feed Conversion Ration (FCR) and cost benefits of the diet groups. The experiment terminated after 6 weeks at the age of 10 weeks.

Statistical analysis: The data collected were subjected to statistical analysis using the General Linear Models procedure of SAS software (SAS Institute, 2001). Means were compared using least significant difference tests.

RESULTS

The feed composition and calculated analysis of nutrient composition of the experimental diets are presented on Table 1. Performance responses to the experimental diets are presented on Table 2. The weekly live-body weights and body weight gains of the birds at the finisher phase (6-10 wks) indicated a decrease for the

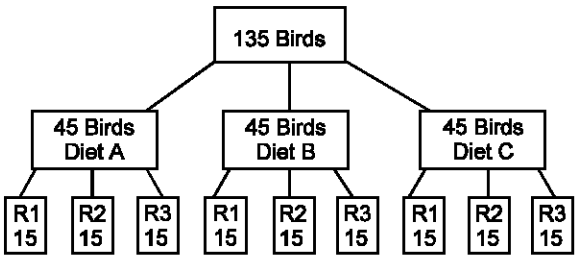

Fig 1: The Experimental Design

The 3 experimental units were made up of the following diet groups:-

Diet A: Broiler finisher alone
Diet B: Broiler finisher plus 20% SPLM
Diet C: Broiler finisher plus 20% SPLM + enzyme (20% Roxazyme G)

birds on Diet B (20%SPLM without enzyme) but significantly increased ($p<0.05$) in the birds fed Diet C (20%SPLM + enzyme). The results took the same trend throughout the experiments.

The results also indicated a decrease in the average daily body weight gain in birds fed with Diet B when compared to the birds fed with Diet A (control diets), but the birds in Diet C manifested a significant improvement ($p<0.05$) above the other treatment groups during the experimental period up to end of week 8. However at end of week 10, when the experiment terminated, the average terminal weight gain equalized in all the diet groups. The weekly feed intake was higher in Diet A than in all other diet groups during WK6 and WK8 respectively. However differences among the diet groups were not significant ($p>0.05$) in the other age groups. At WK 10, however the feed intake in Diet B (20% SPLM without enzyme) increased above the other diet groups but the differences were not significant ($p>0.05$).

The weekly Feed Conversion Ratio (FCR) was poorest in Diet B (20% SPLM without enzyme) while the parameter was superior in Diet C (20% SPLM with enzyme) but not significant ($p>0.05$). The cost/benefit analysis shows that the birds in Diet C had the least costs of production. From Table 2, it can be observed that it cost N109.04 to produce 1.00 kg of broiler meat for birds fed Diet C while it cost N128.33 and N145.90 to produce the same quantity of meat for birds in Diets A and B respectively.

DISCUSSION

Although Okagbare *et al.* (2004) made their feed trials in ruminants using some browse plants, the results obtained confirmed that leaves used had great potential in livestock feeding. The results obtained from the present investigation have confirmed the earlier observations made by Okagbare *et al.* (2004). The present investigation observed that the body weights

Table 1: Composition of experimental finisher diet

Ingredients	Diet A	Diet B	Diet C
SPLM	0.00	20.00	20.00
Roxazyme G (20%)	-	-	+
Maize	54.00	34.00	34.00
Soya bean	30.00	30.00	30.00
PKC	12.50	12.50	12.50
Bone meal	3.00	3.00	3.00
Salt	0.30	0.30	0.30
Vit/TM Premix	0.20	0.20	0.20
Total	100.00	100.00	100.00
Calculated Analysis			
Dry matter(%)	84.00	84.00	84.00
Crude Protein(%)	22.45	20.68	21.05
ME/MJ/kg	13.89	13.58	13.25
Crude fibre(%)	9.05	10.25	10.05
EE(%)	4.36	4.58	4.95

Table 2: Growth performance parameters of broilers on different diet groups

Parameters	Age (wks)	Diet Groups D1	D2	D3	LSD and sig.
Live wt	6	950^{b}	890^{c}	980^{a}	7.76**
(g/bird)	8	1700^{b}	1300^{c}	1900^{a}	7.81**
	10	2400^{b}	2200^{c}	2700^{a}	8.91**
Avg. daily	6	24.29^{b}	18.60^{c}	31.29^{a}	6.05*
body wt	8	87.71^{a}	42.86^{b}	35.71^{a}	6.11*
gain (g)	10	71.45^{a}	71.43^{a}	71.43^{a}	0.29^{NS}
Feed	6	549.5^{a}	509.6^{a}	507.92^{a}	8.05^{NS}
intake	8	686^{a}	658.00^{a}	639.00^{a}	7.59^{NS}
(g)	10	1064^{a}	1190.00^{a}	98.00^{a}	8.19^{NS}
FCR	6	3.21^{a}	3.91^{a}	2.32^{a}	0.085**
(feed/wt gain)	8	1.12^{b}	2.19^{a}	1.06^{c}	0.055**
	10	2.10^{b}	4.20^{a}	2.33^{b}	0.35**
Costs of feeds/ kg body wt (N)		128.33^{b}	145.90^{a}	109.04^{c}	1.15**

^{a,b}means on the same row with different superscripts are significantly different.

and body weight gains as well as other growth traits. such as feed intake and feed efficiency ratio were all improved by enzyme treatment of the SPLM diets even at 20% inclusion level.

This finding agrees with Okoye (2001) who observed that the performance of broiler fed cassava leaf meal (CLM) diet was not inferior to those fed 100% maize diet so long as the inclusion level of CLM did not go beyond 10%, because beyond this level of inclusion, performance traits start to decline. In the present study, the observation showed that at 20% inclusion level, the performance traits were even superior to those birds on 100% maize diet because the exogenous enzyme treatment hydrolyzed the NSP contained in the high fiber diet and thus made the nutrients available to the birds.

This observation tends to confirm the findings of Grimmes *et al.* (1997) and Okonkwo *et al.* (1995), who were all in agreement that as the level of the fiber ingredient such as SPLM increases in the broiler diet, the growth performance characteristics start to decline. If, however, the diet is treated with enzyme, the utilization efficiency of such diet increases thus resulting in improved growth performance.

Results arising from the costs/benefit analysis show that it is highly beneficial to replace maize with SPLM, at least up to 20% level, in the broiler diet. Based on the results (Table 2), with Diet A (100% maize), it cost N128.33 to produce 1 kg of broiler meat, while with Diet B (Maize + SPLM without enzyme) and Diet C (Maize + SPLM +enzyme) it costs N145.90 and 109.04 respectively to produce the same amount of broiler meat. Based on this result, it is highly reasonable to advice farmers especially those that formulate their own feeds to cut down costs by applying enzyme-treated SPLM in their feed formulation.

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