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Utilization by Chickenbroilers(*Gallus Domesticusbrizzen*) of Enzymes SupplementedgliricidiasepiumLEAF MEAL (JACQ)

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Abstract
Ninety six day old broiler chicks brooded and randomly allocated to four dietary treatments of 24 birds replicated into three groups with eight birds per replicate. Four experimental diets were formulated; the test ingredient is *Gliricidiasepium* leaf meal. Two of the diets were formulated without enzymes supplementation i.e diet A and diet B while the remaining two treatments were supplemented with Roxazyme (G2) and Maxigrain). *Gliricidiasepium* leaf meal was included at the level of 5% replacement of dietary soyabean meal in diets B, C and D. After eight weeks datacollected were feed intake, weight gain and body weight changes. Daily feed intake was more significantly ($p<0.05$) reduced in birds fed control diet. Highest($P<0.05$) body weight gain(36.46g/d) and nutrients utilization was observed inbirds fed with Maxigrain (diet D) supplement ($p<0.05$). The best,even better than the control, improvement in the response indices were obtained in birds fed Maxigrain diet D. Hence forage *Gliricidiasepium* meal of 5% could be included with 0.10% Maxigrain.
Keywords: Broilers,Enzymes,Gliricidia,Performance-characteristics,Nutrients-utilization

1.Introduction

The conventional protein feedstuffs for poultry such as soyabean, groundnut cake, and fish meal are scarce and expensive because they are competed for by humans as food and other industrial uses. The rising cost of finished feed, which is 70 - 80% of the cost of production among others, is a major setback.. The prices of such conventional protein feed ingredients such as groundnut cake, soyabean meal and fish meal have soared so high in recent times that it is becoming uneconomical to use them in poultry feeds (Esonu*et al.*, 2003). There is need; therefore to look for locally available and cheap sources of feed ingredients, particularly those that do not attract competition in consumption between humans and livestock such as Gliricidia for the formulation of balanced ration. Leaf meals do not only serve as protein source but also provide some necessary vitamins, minerals and also some yellow colour of broiler skin, and shank (Esonu et al., 2003) Leafmeals, Fasuyi and Kehinde,(2009) investigatedeffect of cellulase-glucanase-xylanase combination onthe nutritive value of Telfairiaoccidentalisleaf meal inbroiler diets ,Mmereole ,(2009) evaluated dietary inclusion of sweet potato (*lpomeabatatas*) leaf meal(SPLM) with or without enzymy treatment in broilers diet,also ,Onibi et al.,(2008) and Iheukwumere*et al.*,(2008) did feed broilers with cassava with leucaena leaf meals and cassava leaf meal respectively.Hence LM are gaining acceptance as feed stuff in poultry diet, they are locally available and considered to be non-conventional feeding stuff. The nutrient profile of these leafmeals compare favourably well with some conventional feeding stuffs. Satisfactory performance have been reported of various leaf meal tested in the diet of some classes of poultry birds. *Gliricidiasepium* is a multipurpose tree legume that is second only to *Leucecanealeucocephala* in worldwide popularity. Gliricidia possess the ability to provide large quantities of high quality forage matter all-year-round as well as the ability to maintain a sustainable environment through nitrogen fixation thus replenishing the soil,though it contains bitter tasting coumarols,cyanogenic , glycoside,tannin saponin, and cell wall content that's makes it lessusefulfor monogasters (Simons and Stewart, 1994). Exogenous enzyme supplements(classical feed biotechnological method) are now widely used (Yb et al.,2004, Ahmed et al ., 2007 Fasuyi and Kehinde,2009,Duru and Dafwang, 2010)in poultry diets in an attempt to improve nutrient utilization, health and welfare of birds, product quality and to reduce pollution as well as increase the choice and contents of ingredients at cheaper cost which are acceptable for inclusion in diets (Bedford 2000). There is need therefore to investigate the effect of these unconventional feed resources on the performance characteristics of broiler.The main objective of the study was to determine the effect of enzymes on performance characteristics and nutrient utilization in broilers fed*Gliricidiasepium* leaf meal.

2 Materials and Method

2.1Study Location

This experiment was carried out at the Poultry unit of the Teaching and Research Farm of College of Agricultural Sciences, OlabisiOnabanjo University, Yewa Campus, Ayetoro, Ogun State. Ayetoro is located in latitude $7^0 15^i$N Longitude $3^0$3E a deciduous derived savannah zone in Ogun State. Climate sub-humid tropics with an annual rainfall of 963.3mm in 74 days with maximum of 29^0c during the peak of wet season and 34^0c during the dry season; mean annual relative humidity is 81^0c.Ayetoro lies between 90 and 120m above the sea level. The entire area is made up of undulating surface, which is drained majorly by River Rori and River

Ayinbo.

2.2Processing Of Test Ingredient

Fresh, young *Gliricidiasepium* leaves were harvested, dried under shade for several days, milled to obtain Gliricidia Leaf Meal (GLM) and incorporated into four broiler diets in which soyabean was replaced with Gliricidia Leaf Meal at 0% (control diet) and 5% respectively for the other diets . The diets (Table 1) was formulated to contain approximately 21.45% and 20.50% Crude protein and 2644.36 Kcal/kg and 2567.53 Kcal/kg Metabolizable Energy (ME). The diets (Tables 2and 3) was formulated to contain approximately 21.59% and 20.65% Crude protein and 2675.36 Kcal/kg and 2553.53 Kcal/kg Metabolizable Energy (ME).

2.3Experimental Birds

A total of 96 day-old broiler chicks (Rock harnicks) was purchased at UNAB Leventis Farm, Abeokuta. The birds were divided into four treatments at 24 birds per treatment. Each treatment was replicated three times at 8 birds per replicate. The feeding trial lasted for eight weeks. Feed and water were supplied *ad-libitum.* Vaccines against New Castle disease were administered to the birds immediately after hatching and when they were 3 weeks old respectively. The birds were de-wormed adequately, while antibiotics were also given.

2.4Experimental Diets

Four experimental diets were formulated (Tables 2 and 3). Two of the diets were formulated without enzyme supplementation i.e Diet A and Diet B while the remaining two of the diets were formulated with enzyme representation (Roxazyme and Maxigrain) i.e Diet C and Diet D respectively. The test ingredient (Gliricidia leaf meal) was included at 5% replacement of dietary soyabean.

2.5Growth Study

The experimental diets were offered feed and water *ad libitum* in separate feeders in the morning, and afternoon. Birds in each replicate were weighed at the commencement of the experiment and weekly thereafter. Feed consumption record was kept on weekly basis.

2.6Metabolic Studies

The metabolic study was carried out between the seventh and eighth week of the feeding trial. Three birds per replicate were put in metabolic cages. Droppings from each replicate group of birds were collected on a wooden sheet placed under the cages. The droppings collected were weighed fresh, dried to constant weight at 100% and ground before chemical analysis.

2.7Economic Analysis

The effects of experimental diets on feed cost and economy of feed conversion to body weight were analysed as thus:

1. The cost of dietary ingredients (#/kg) of each treatment was noted
2. The feed intake per bird was also noted and was used to multiply the cost/kg of feed in order to know the cost of feeding a broiler for the period of experiment.
3. The cost /kg body weight also calculated by dividing the cost of feeding by the body weight gain (g).

2.8Chemical And Statistical Analysis

Ground samples of feeds, refusals and faeces were analyzed for dry matter (DM) bydrying samples at 105 ◦Cfor 24 h in forced air oven. Ash content was measured after igniting samples in a muffle furnace at 550 ◦C for 4 h. The crude protein (CP) was determined by Kjeldahl method (AOAC 1995)Ether extract (EE) was determined by Soxhletmethod (AOAC 1995)The resultant data from analysis were used to calculate the digestibilities and were further subjected to analysis using one -way and significantly different means were separated using least significance difference at 0.5 level of probability .S.A.S (2002).The general linear model is us defined thus

$Xy = \mu + \alpha i + eij$

Xy= individual data generated from the fixed treatment (effects)

μ= Grand population mean

αi = the fixed treatments effects

eij= the error (replicate) term within each treatment.

Table.1; Chemical Composition Of Test Ingredient (GLM)

GLM	(%)COMPOSITION
Moisture	6.48
Crudeprotein	24.38
Etherextract	1.75
Crudefibre	12.45
Ash	11.58
NFE	43.36

Table2 Percentage Composition Of Experimental Starter Diets

Ingredients (%)	Diet A (Control)	Diet B with GLM	Diet Diet D GLM with R	GLM with M
Maize	45	45	45	45
SBM	20	15	15	15
GLM	-	5	5	5
GNC	8	8	8	8
Fish meal	3	3	3	3
Oyster shell	10	10	10	10
Wheat offal	11.25	11.25	11.25	11.25
Bone meal	2	2	2	2
Vit. Premix	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated chemical composition				
Crude protein	21.45	20.50	20.50	20.50
Ether extract	2.64	3.35	3.35	3.35
Crude fiber	6.79	7.08	7.08	7.08
Ash	2.74	3.02	3.02	3.02
Energy [Kcal/kg]	2644.36	2567.53	2567.53	2567.53

GLM = Gliricidia leaf meal, SBM = Soyabean meal, GNC = Groundnut cake,
R = Roxazyme G2, M = Maxigrain

Table 3. Percentage Composition OfExperimental Finisher Diets

Ingredients (%)	Diets A (Control)	Diets B with GLM	Diets C GLM with R	Diets D GLMwith M
Maize	41	41	41	41
SBM	20	15	15	15
GLM	-	5	5	5
GNC	8	8	8	8
Fish meal	3	3	3	3
Oyster shell	10	10	10	10
Wheat offal	15.25	15.25	15.25	15.25
Bone meal	2	2	2	2
Vit. Premix	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated chemical composition				
Crude protein	21.59	20.65	20.65	20.65
Ether extract	2.65	3.36	3.36	3.36
Crude fiber	6.49	6.78	6.78	6.78
Ash	2.78	3.06	3.06	3.06
Energy [Kcal/kg]	2675.36	2553.53	2553.53	2553.53

GLM = Gliricidia leaf meal, SBM = Soyabean, GNC = Groundnut cake, R = Roxazyme G2, M = Maxigrain

3.Results And Discussion

Tables 1-3 show test forage ,starters, and finshers composition respectively while in Table 4,final weight and body weight gains of birds reduced with inclusion of Roxazyme G2 (diet C), though there were better weight gains with Maxigrain (diet D) supplement ($p<0.05$). The observed improvement in the weight gains of the enzyme supplemented diet D (Maxigrain) may be explained by the fact that exogenous enzymes supplement the digestive enzymes of monogastric animals by aiding the breakdown of non-starchy polysaccharides, protein and antinutritional factors thereby increasing their nutritional value [6] Birds placed on diet D (5% GLM with Maxigrain) was observed to have highest feed intake per day. This may be due to action of enzyme cellulase that breakdown cellulose for more energy and releases locked nutrients (Chot, 2006)There was significant difference in feed conversion ratio of the experimental diets. Improvements in the efficiency of utilization of poultry diets have been reported as a result of enzymes supplementation of feed(Chot, 2006)In all, it appeared that birds on diet D (5% GLM with Maxigrain) had better performance even than the control diets(Ogungbesan*et al.,*2013).

Table 4 : Effect Of *GliricidiaSepiumLeaf Meal* Supplemented With Enzyme On The Performance Characteristics Of Broiler Fed On Experimental Diets

Parameters	A (0%) (Control)	B (5% GLM)	C (5%) (GLM with R)	D (5%) (GLM with M)	SEM
Initial body weight(g)	38.65	36.58	38.13	38.46	1.13
Final body weight (g)	1900^{b}	1850^{c}	1740^{d}	2080^{a}	6.52
Body weight changes (g	1861.35^{b}	1813.42^{c}	1701.87^{d}	2041.54^{a}	5.24
Daily body weight gain (g)	33.24^{b}	32.38^{c}	30.39^{d}	36.46^{a}	1.14
Daily feed intake (g)	101.9^{d}	113.4^{c}	115.85^{b}	116^{a}	1.32
Feed conversion ratio	3.07^{d}	3.50^{b}	3.81^{a}	3.18^{C}	2.38

^{abcd} means within the same row bearing different superscripts are significantly different (p<0.05).
SEM = Standard Error of Mean,

Crude protein digestibility(Table 5) was significantly (P<0.05) affected by dietary treatment birds on diet D (5% GLM with Maxigrain) had superior digestibility of protein compared to the other diets. Diet A (Control) had the least protein digestibility (69%).Crude fiber digestibility was also significantly (P<0.05) influenced by dietary treatment. These results were in accordance with the findings of (Ademola*et al*.,2012) who reported an improvement in the nutrient digestibility due to enzyme addition. Ash digestibility and Lipid digestibility were alsosignificantly(P<0.05) influenced by the dietary treatment(Ademola*et al*.,2012, Ogungbesan*et al.,*2013)

Table 5; EffectOf *GliricidiaSepiumLeaf Meal* Supplemented With Enzyme On The Nutrient Digestibility Of The Experimental Diets

Parameter	A (Control)	B (5% GLM)	C (5% GLM with R)	D (5% GLM with M)	SEM
Crude protein (%)	69^{d}	72^{c}	75^{b}	78^{a}	0.88
Lipid (%)	92^{b}	91^{b}	92^{b}	94^{a}	1.00
Fiber (%)	55^{c}	52^{d}	62^{b}	64^{a}	1.00
Ash (%)	60^{b}	60^{b}	61^{a}	63^{a}	1.00
Dry matter	78^{c}	72^{d}	79^{b}	80^{a}	0.67

abcd means within the same row bearing different superscripts are significantly different (p<0.05).
SEM = Standard Error of Mean

Table 6 shows the cost effectiveness of the different dietary treatment. Diet 1 was the most expensive in terms of cost per Kg. Addition of GLM reduced the cost of feed per kg. Feed cost per kg reduced with increasing concentration of GLM from diet A to diet D. However, the cost of Roxazyme increased the cost per kilogram of diet containing it. Nonetheless, supplementing the diet D with Maxigrain per kilogramme of diet resulted in cheaper cost per kilogramme weight gain compared to other diets. This outcome in diets D, favours inclusion of the enzyme Maxigrain,((Ademolaet al.,2012, Ogungbesanet al.,2013)) since the desire of every investor is to maximize profit and productivity at the least cost. Hence, Maxigrainhas practical advantages (Maxigrain® is blend of the most relevant digestive enzymes to serve the purpose of optimizing the cost & performance of birds.The following are active ingredients in Maxigrain® enzyme and their effect on target substrate;α-amylase:Hydrolyzesglycosidic bonds from starchy material liberating metabolizable sugar.;Xylanase:Acts on residues of arabinoxylans and mannans,;β-Glucanase:Hydrolyzes beta glucans,;Exo-Cellulase:Hydrolyzesglycosidic bonds to liberate metabolizable sugar,;Pectinas:Hydrolyzespectic acid,;Protease:Acts on proteins to liberate peptides and amino acids,;Phytase:Hydrolyzesphytic acid to release phosphorus,;Lipase:Complements indigenous lipases to digest extra fat added to the feed.Hence ,benefits of Maxigrain® enzyme ,optimizing the use of non-conventional feed ingredients,Improving weight gain,Improve litter quality and dropping consistency,improving feed conversion ratio (FCR),improves egg production and shell quality andreduces levels of DCP incorporation in the feed substantially) and is strongly recommended for use in broiler diets..Per adventure there is apparent lack of response to enzyme supplementation,reasons advanced by (Acamovic 2001) include the following ;the likelihood/possibilty of the diet being fed be of extremely good quality and allow the animals to perform close to their genetic potential.,that enzymehas the incorrect mains pecificity (amylases,pectinases,β-glucanases,arabinoxylases,cellulases,hemicellulases,,acidproteases,alkalineproteases,phytases,esterases,lipases) and or attendant supplementary activity for the substrate,denaturation of the enzyme before the dietis consumed,or supplementation of the diet with wrong enzyme,variation within an ingredientsin the concentration or activity of proteinaceous antinutrients to the enzyme,variation in the quality of feed ingredients,animal stage of growth /maturity.It must be emphasized ,however according to Bedford (1995) that for commercial use exogenous.enzymes must be able to survive the rigours of feed processing (Temperature,Pressure,and

Moisture)and the in-hospitable.Not only do these enzymes have to survive the fluctuations of pH and proreolytic attack by enzymes,but they also have to operate in these conditions at a meaningful rate in order to accomplish the neccesary degrees of digestionof the intended substrate but lastly , application of enzymes allow the animal to plant phosphorus and depend less on inorganic P thereby reducing P environmental pollution(Bedford 1995)

Table 6;Economic Analyses Of Feeding Broiler On Experimental Diet Supplemented With *GliricidiaSepium Leaf Meal,* Enzyme MaxigrainAnd Roxazyme.

Treatment	Cost of feeding	Cost per kg body weight	Cost per kg feed
1	8315.04	250.15	81.60
2	8845.20	273.17	78.00
3	9082.64	298.87	78.40
4	9071.20	248.80	78.20

Cost per kilograms feed, cost per kilograms weight gain of Broiler bird fed different dietary treatment

4. Conclusion AndReccomendation

Based upon the findings in this study, it is recommended that 5% *Gliricidiasepium* leaf meal and 0.10% Maxigrain can be incorporated into broiler diets respectively. Gliricidia being a multipurpose legume specie will in addition be of environmental asset(wind break,erosioncontrol,global warming control,),industrial/raw material sources(pulp for paper making,tree for charcoal,timber for construction,logs for fuel,poles for agricultural staking, live fencing for paddocking and ranching). Nutritionally,being an herbage it is rich in the pigment carotene, which confers yellowish colouration to the resultant flesh and ingredient that help the sight of human consuming them .Further research on various level of inclusion of GLM is needed to confirm these findings and to elucidate the mechanism which are responsible for the better performance of broiler chickens on diet with enzyme (Maxigrain).

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