Journal of Biology, Agriculture and Healthcare
ISSN 2224-3208 (Paper) ISSN 2225-093X (Online)
Vol.4, No.22, 2014

Egg- qualities ,Organs- weight and Carcass-attributes of laying hens (Gallus domesticus brizzen) fed Gliricidia sepium leaf meal levels supplemented with Maxigrain®

Ademola Ogungbesan*,[1]., Olubunmi Fasina[1], . Gabriel Adeleke[1]. and Adetoyin Alabi[2],

1)Animal production department C.A.S Ayetoro O.O.U Ogun state Nigeria

2)Agriculture and Rural Productivity Dept. ,National Productivity Center,Benin office, Federal Secretariat Edo State, Email:adetoyincoj@yahoo,com

*Email add:amkgbesan@gmail.com.Mobile nos:08057458575

Abstract

Sixty(60) laying hens (Rhode Island Red strains) products were investigated after being fed Gliricidia leaf meal (GLM) supplemented with Maxigrain® enzyme The birds were randomly allotted to five dietary treatments of 12 birds per treatment; each treatment was replicated into 4 groups with 3 birds per replicate. Five experimental diets were formulated; the test ingredient being Gliricidia sepium. Three of the diets were formulated with enzyme supplementation i.e. diets, C, D, E while diet A(control) was without enzyme supplementation and B(control with enzyme). Gliricidia sepium leaf meal was included at 5%, 7.5% and 10% replacement of dietary soyabean meal in diets C, D and E respectively. The feeding trial lasted for twelve weeks after which egg qualities, organ indices and carcass variables were monitored. data collected were analysed using One-way ANOVA, Of the egg qualities,apart from henday production, haugh unit, albumin weight and index all other qualities were highest in 5%GLM,Also the best organ traits indices ,dressed weight was highest in 5%GLM .Concerning carcass characteristics 5%GLM recorded the highest ($P<0.05$) in all other characters except breast, shank, and neck weights 5%GLM supplemented with Maxigrain® will serve as a potential abundant non-conventional source of ingredients and also as a source poultry products with high human preference and maximum satisfaction.

Key words:, Egg-qualities, Gliricidia, Laying-hen, , Maxigrain®, ,Organ/Carcass-characteristics,

1 Introduction

The limitation of poultry production in Nigeria has hinged particularly on the cost of feed production. Feed cost accounted for about 70-80% of the total cost of production due to the competitiveness of the conventional protein feed sources between humans and poultry. In fact, this singular problem is conspicuously responsible for the widening animal protein intake shortage because animal products are produced at costs out of reach of the populace. There is the need to produce at an affordable price to the consumers and also the farmers through the search and use of cheaper feed ingredients that are always available and have no competition with man's dietary demands i.e. non-conventional sources of feeds like Gliricidia sepium so as to meet 0.83g/kg per day protein requirement for man. . Leaf meals are gaining acceptance as feed stuffs in poultry diet as due to its availability and its similar nutrient content and are considered to be un-conventional feeds. Satisfactory performances have been reported of various leaf meals tested in the diet of some classes of poultry birds(Ige et al., 2006).Exogenous enzyme supplements are used widely in poultry diets in an attempt to improve nutrient utilization, health and welfare of birds, product quality and to reduce pollution as well as to increase the choice and content of ingredients which are acceptable for inclusion in diets (Acamovic, 2001) The role of enzymes as feed additive in poultry diets is well established. The advent and use of commercial feed enzymes in livestock feeding has opened new horizon for the use of hitherto waste feedstuff without detrimental effect on poultry performance. The objective of the study was to evaluate the effect of Maxigrain® supplementation on performance characteristics and nutrient utilization in layers fed Gliricidia sepium leaf meal. It is thus expected that this study would provide a basis for recommendation of the supplementation of Gliricidia sepium leaf meal in layers diet.

2 Materials And Method

2.1 The Site of the study

This experiment was carried out at the poultry unit of the Teaching and Research Farm of the College of Agricultural sciences, Olabisi Onabanjo University, Yewa Campus, Ayetoro, Ogun State. Ayetoro is 35km North West of Abeokuta, located on latitude $70^0$12' N Longitude $30^0$3'E; a deciduous derived savannah zone in Ogun State. Climate sub-humid tropics with a gravelling ultisol soil and 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%. 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.

2.2 Processing of test ingredient

Fresh, young Gliricidia sepium leaves were harvested from pasture and range unit of the College. The long stalks were then removed to reduce fibrousness before air drying. Air drying in shade was done to reduce the moisture content of fresh leaves, to prevent fungal growth and for easy milling. Drying was completed within few days of good sunshine (while in shade). The dried Gliricidia leaves was then milled to obtain Gliricidia Leaf Meal (GLM) and incorporated into five layers' diet in which Soyabean was replaced with Gliricidia Leaf Meal.

2.3 Management of experimental birds

A total of 60 point of lay (16 weeks) laying birds was purchased from a reputable farm at 16 weeks of age. The birds were allotted randomly into five treatments at 12 birds per treatment. Each treatment was replicated three times at 4 birds per replicate. The experiment lasted for 12 weeks. Feed and water were given ad-libitum. The birds were dewormed and vaccinated appropriately. Body weight of each bird was taken at the beginning of the experiment and at 2 weeks intermittently. The parameters monitored were feed intake, Hen day production, egg weight, and body weight changes. Egg quality parameters such as shell thickness, yolk index, yolk colour were measured every two weeks. The eggs were broken with a blunt knife and contents poured on a saucer positioned on a flat surface. The albumen and yolk heights were measured using a spherometer. Yolk and albumen diameter was taken as the maximum cross-sectional diameter of the yolk using a pair of calipers and read on a ruler in millimeter. The yolk index was calculated as the proportion of yolk height to diameter and the albumen index calculated as the proportion of albumen height to diameter. Shell thickness was determined with a micrometer screw gauge after the removal of the contents. Haugh unit scores were calculated from egg weight and albumen height using the formula;

$HU=100\log (H+7.57-1.7W^{0.37})$, where;

H is the height of the albumen

W is the weight of the albumen

$$\text{Albumen index} = \frac{\text{albumen height}}{\text{(albumen length+ width/2)}}$$

$$\text{Yolk index} = \frac{\text{yolk height}}{\text{yolk width}}$$

2.4 CARCASS EVALUATION

At the end of the eight weeks, three birds were randomly selected from each treatment (i.e one from each replicate), fasted for 16 hours, weighed the following morning and were slaughtered by severing the jugular vein with a sharp knife and allow to bleed for 5 minutes. Later, birds were scalded at 65^0c in water for 30 seconds before defeathering. Then, carcass was eviscerated and data were collected for organs (live, dressed ,gizzard ,liver, kidney, heart, full g.i.t, small intestine and large intestine weights) and carcass attributes (breast, drumstick, thigh, head, shank, neck, tail, wing, fore back and hind back weights (Sams, 2001)

2.5 Chemical analysis

Ground samples of test ingredients was analyzed for dry matter (DM) by drying samples at 105 ◦C for 24 h in forced air oven. Crude 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) crude fat (Cfat) was determined by Soxhlet method (AOAC 1995) and crude fibre according to the method of Weende (kim et al., 1967)

2.6 Statistical Analysis

Data obtained from these samples were further subjected to analyses using one way ANOVA / completely randomized design , model sums of square were partitioned to test the linear and quadratic trend of inclusion/supplementation using the general linear models (GLM) procedures as package due to(S.A.S, 2002) and significantly different means were separated using least significance difference at 0.5 level of probability in the same package; The general linear model is as defined thus:

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

Xy= individual data generated from the fixed treatment (Diets A-E) effects

μ= Grand population mean

αi = the fixed treatments (Diets A-E) effects

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

Table 1 Gliricidia sepium chemo assay

Composition	GLM (%)
Dry matter (%) (% Fresh matter)	31.82
Crude protein (%)	24.38
Crude fibre (%)	18.93
Crude fat (%)	1.75
Crude Ash (%)	11.58
Nitrogen-free extract (%)	43.36

Table 2: Percentage Composition of Experimental layers Diets

Ingredients (%)	Diet A (Control)	Diet B 0% GLM	Diet C 5% GLM	Diet D 7.5% GLM	Diet E 10% GLM
Maize	40.00	40.00	40.00	40.00	40.00
Soybean meal	20.00	20.00	15.00	12.50	10.00
Gliricidia leaf meal	-	-	5.00	7.50	10.00
Palm kernel cake	10.00	10.00	10.00	10.00	10.00
Wheat offal	14.25	14.25	14.25	14.25	14.25
Fish meal	3.00	3.00	3.00	3.00	3.00
Oyster shell	8.00	8.00	8.00	8.00	8.00
Bone meal	4.00	4.00	4.00	4.00	4.00
Vit-premix*	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
TOTAL	100.00	100.00	100.00	100.00	100.00
Calculated Chemical Composition					
Crude protein	18.94	18.94	17.96	17.47	16.98
Crude Fat	7.06	7.06	7.36	7.50	7.66
Crude fibre	7.06	7.06	7.36	7.50	7.66
Crude Ash	2.87	2.87	3.00	3.07	3.13
Energy[KCAL/KG]	2655.3	2655.3	2534.2	2473.7	2413.2

M= Maxigrain®

3 RESULTS AND DISCUSSION

As shown in table 1, DM, CP, CF, CFt ,CA, and N.F.E are 31. 82 (% fresh matter) 24,38, 18.93 1.75, 11.58, 9.16 and 43.36 (%DM) respectively. These value are comparable to and with the observations of Chadokar, 1982,and Carew 1983. In as much, as they are phytochemical, their concentrations are bound to be influenced by factors such as plant parts assayed, age of plants, session of harvests, soil fertility, specific and varietal variations, cultivar differences, post-harvest treatments, and growing conditions (water, and drought stress, photo periodicity) as well as laboratory analytical dissimilarities .(Ogungbesan et al.,2014[a])

Table 3; Effect Of Gliricidia Leaf Meal Supplemented With Maxigrain® On Egg Quality Parameters Of Lay

Parameters	Diet A 0%(Control)	Diet B 0%ENZ	Diet C 5% GLM	Diet D 7.5 % GLM	Diet E 10% GLM	SEM	P LIN	R QUAD	O	B
Feed intake, g/d	90.00^{c}	103.00^{b}	117.00^{a}	116.00^{ab}	114.00^{ab}	0.09	0.27	0.37		
Henday production, %	87.60^{a}	86.90^{a}	85.30^{b}	80.80^{c}	76.00^{d}	0.74	0.42	NS		
Egg weight, g	54.33^{a}	52.33^{b}	54.33^{a}	53.67^{ab}	54.00^{ab}	0.49	0.07	0.18		
Haugh unit, %	24.69^{d}	35.54^{c}	35.02^{c}	37.96^{a}	36.49^{b}	0.83	0.12	0.19		
Feed/kg egg (kg)	1.67^{d}	1.98^{c}	2.17^{a}	2.19^{a}	2.11^{b}	1.05	0.03	0.51		
Shell thickness, cm	0.35^{b}	0.37^{ab}	0.38^{a}	0.36^{ab}	0.35^{b}	0.002	0.16	0.36		
Yolk weight, g	13.00^{a}	1.00^{b}	13.00^{a}	12.00^{ab}	13.00^{a}	0.10	0.06	0.24		
Albumen weight, g	39.00^{a}	32.00^{c}	34.00^{b}	30.00^{d}	33.00^{b}	1.00	0.09	0.41		
Albumen index	13.11^{d}	13.72^{c}	14.70^{b}	13.18^{d}	15.51^{a}	1.00	0.08	0.29		
Yolk index	0.37^{ab}	0.32^{c}	0.38^{ab}	0.36^{b}	0.42^{a}	0.42	0.1 9	0.25		

^{abcd}means within the same row bearing different superscripts are significantly different ($p<0.05$)

SEM= Standard Error of Mean, NS= Not Significant,PROB=Probability.LIN=Linear,QUAD=Quadratic

Feed intake (DMI) (g/d) as depicted in table 3 shows a gradual increase with levels and peaked at 5% (117.00) and linearly thereafter decreased to 114.00 (10%M). This is due to influence of enzyme in degrading the fibrous part of the feed at 5%GLM level (which is optimum as reported by Odunsi et al., (2002), and Ogungbesan et al., (2014)[b]. The highest ($P < 0.05$) egg weight in grams was recorded in control and 5%GLM . Hen day production (%) was highest in control and O GLM which shows the effect of GLM inclusion in the diet (Probably due to its bitterness, fibrous nature and secondary plant metabolites) which is possible to be tolerated by birds if bird fed with GLM for a longer period of time through adaptation (G.I.T. anatomical changes) as documented by Marounek et al.,(2008) Odunsi et al.(2002) and Ogungbesan,et al., (2014)[b]. Haugh units % which ranged from 24. 69 (control) to 37.96(7.5 %.M), Albumin weight (g) which was from 30.00 (7.5%GLM) to 39.00 (control) and Albumin index ranging from 13.11 (control) to 15.51 (10%GLM) are all indices of albumen quality which depict the freshness of the egg (Meng et al., 2010) and hence its storability. There is no definite trend (increment or decrement) in relation to the levels of GLM. Fed/kg egg in kg ranged from 1.67 (control) to 2.19 (7.5%.GLM).This could be in part due to the fact that poultry eat to satisfy their energy requirement (Ogungbesan et al., 2014[b] and Yang et al.,2009).Shell thickness in cm was lowest ($P<0.05$) control and 10%GLM(0.35) and highest ($P<0.05$) in 5%GLM (0.38) is an indication of efficient utilization in term of retention and absorption of element specifically Ca and P and also pertinent in logistics of egg from producers (Farmer) to consumer (People) at places far from the farm. Hence ensuring safe delivery to end user (Akinde, et al., (2007) Yolk weight(g) was from 0%GLM (11.00) to control, 5%GLM and 10%GLM(13.00).The production implication is that there enough nutrient reserved in the yolk especially protein fat, and pigment (Carotenes and xanthophylls to be precise as a result virtually all the treatment can sustain normal egg formation (Odunsi et al., 2002) and Lastly, yolk index which was highest ($P<0.05$) in 10%M(0.42) and lowest in 0%GLM(0.32) is signifying the spherical in shape and strength of the yolk membrane. This is essential for keeping the shelf life of the egg. This also goes to show the positive influence of the combinations on the egg nutritional and keeping quality (Ogungbesan et al , 2014[b])

Table 4; Effect Of Gliricidia Leaf Meal Supplemented With Maxigrain® On Organ Characteristics Of Layers

	Diet A	Diet B	Diet C	Diet D	Diet	SEM	P R O B	
Parameters	0%(Control)	0% ENZ	5%GLM	7.5%GLM	10%GLM		LIN	QUAD
Live weight g	1615[a]	1550[ab]	1655[a]	1515[ab]	1355[c]	19	0.04	0.48
Dressed weightg	1585[b]	1525[ab]	1600[a]	1485[c]	1335[d]	11	0.09	0.50
Gizzard weightg	42.5[c]	46.5[ab]	42.0[d]	47.0[a]	44.5[b]	2.1	0.10	0.37
Liver weightg	26.0[a]	27.0[a]	23.0[b]	27.0[a]	23.0[b]	0.8	0.08	0.44
Kidney weightg	1.0	1.5	1.5	1.5	1.5	0.02	0.01	0.01
Heart weigh g	6.0[a]	5.0[b]	6.0[a]	4.5[c]	4.0[c]	0.01	0.05	0.27
Full G.I.Tw g	206.5[a]	164.5[d]	191.5[b]	169.5[d]	172.0[c]	3.4 0	0.1 7	0.30
Small intestine wtg	57.0[a]	40.5[b]	36.0[c]	37.0 [c]	42.5[b]	7.6	0.23	0.29
Large intestine wt g	49.0[a]	34.0[b]	34.5[b]	29.0[c]	21.5[d]	5.2	0.64	ns

[abcd]means within the same row bearing different superscripts are significantly different ($p<0.05$)

SEM= Standard Error of Mean, PROB=Probability,LIN=Linear,QUAD=Quadratic

Live weight as shown in table 4 (g) was highest (1655) ($P<0.05$) in 5%GLM and lowest (1355) in 10%GLM which also influences the dressed weight(g) that had same trend 5%GLM(1600) 10% GLM in (1335). The inclusion of GLM and at 5% level must have potentiated high nutrient utilization efficiency and hence gain in body weight, This levels (5%GLM) has also been observed by Odunsi et al., (2002) and Ogungbesan et al., (2014)[b] (Gizzard weight (g) was lowest (42.00) and highest (47.0) in 5%GLM and 7.5%GLM respectively. Although no definite trend was observed vis – a- vis levels of gliricidia but unusually increment in weight of this organ might be due to increase activity from type of feed fed which implies that though there is GLM, the enzyme must have done some degradation of the fibrous components the feed thereby reducing the grinding pressure on the musculature of the gizzard (Fasuyi 2007)In the same vein, Liver weight(g) was lowest in 5% GLM and 10%GL M (23.0) similarly hepatomegaly (enlargement of liver) and hyperhepatocytosis (increase in cell and weight of liver) have been attributed to excess activities in terms of degradation, attenuation and detoxification of feed inherent allelochemicals or deleterous principles as observed by Yang et al., (2009). The control had lowest but similar ($P>0.05$) value (1.0) while the rest had similar ($P>0.10$) (1.5) values of kidney weight. Decrease in this organ weight, nephritic dystrophy is common where there is less furniture of nutrients from the diet and hypertrophy (size and weight increment) is a characteristics of highly nutritious diet or ration like what was witnessed here and also been confirmed by Yang et al., (2009). The same explanation could be arrogated to the trend also observed in cardiography, in that heart weight (g) was highest ($P<0.05$) in control and 5%GL M (6.0) and lowest in 10%GLM (4.0) cardiac hypertrophy must have been brought about by adequate nutrients from the diets. Similar reasons could be ascribed for the full G.I.T weight (g) which was highest (206.50) ($P<0.05$) in control and lowest in 0%GLM (104.50) which translate to improve nutrients efficiency of utilization mediated through enzymatic action of nutrient release and subsequent “eutrophication” of the tract in general but the increment in small intestine and large intestine recorded in control and 0%GLM typified and exemplified the action of enzyme in directly degrading the feed fibrous components and indirectly reducing the digestive and degrading activities of the intestine there by reducing there weights in enzyme supplemented diets (5% GLM to 10%GLM) (Zanu et al., 2013)

Table5 Effect Of Gliricidia Leaf Meal Supplemented With Maxigrain®On Carcass Characteristics Of Layers

	Diet A	Diet B	Diet C	Diet D	Diet E	SEM	P R O B	
Parameters	0%(Control)	0%ENZ	5%GLM	7.5% GLM	10%GL M		LIN	QUAD
Breast weigh g	244.5[a]	241.0[ab]	236.5[b]	224.0[b]	255.5[a]	16	0.29	0.37
Thigh weight, g	70.5[ab]	61.5[b]	70.0[ab]	72.5[a]	63.0[b]	1.8	0.10	0.25
Head weight, g	48.5[a]	37.5[ab]	37.5[ab]	36.0[c]	39.0[b]	3.4	0.23	0.35
Shank weight g	25.0	20.0[c]	20.5[b]	19.5[d]	24.5[ab]	2.60	0.09	0.31
Neck weight, g	77.5[a]	64.0[c]	73.0[b]	68.5[c]	65.5[ab]	3.8	0.30	0.44
Tail weight, g	15.5[ab]	12.0[c]	15.5[ab]	11.5[d]	13.5[b]	1.6	0.07	0.49
Wing weight, g	57.0[bc]	53.5[c]	62.0[a]	54.0[c]	55.0[c]	4.60	0.19	0.42
Fore back wt g	119.0[c]	135.5[b]	155.5[a]	123.5[b]	100.0[c]	9.8	0.08	0.35
Hind back wt g	141.0[e]	155.5[d]	188.5[a]	161.5[c]	172.0[b]	[s]9.4	0.36	.0.28

[abcd]means within the same row bearing different superscripts are significantly different ($p<0.05$)

SEM= Standard Error of Mean, PROB= Probability LIN=linear, QUAD=quadratic

The primal cuts which is a major function of dressed weight in Table 5 revealed that, apart from breast weight (g) whose highest value ($P<0.05$) was recorded in 10 %GL M (255.50) thigh weight (g) was most pronounce in 7.5 % GLM (72.5%), head weight (g) which was biggest ($P<0.05$) in control (48.50) shank and Neck weight with highest ($P<0.05$) recorded in control (25. 0) and control (77.5) respectively, all other were highest in 5 %GL M, which is also an indication of the enhancing property of enzyme in the nutrients utilization efficiently. (Zanu et al.,2013). The above situation shows once again the advantages of enzymes supplementation at a relatively cheaper rate (Ogungbesan et al., 2014[b]), Furthermore, inclusion of leaf meal especially that of legumes will also confer other advantages like phyto–ostrogen which will also increase efficiently of utilization from of nutrients(Ogungbesan et al., 2014[c]), anti – helminthic properties which reduce the incidence (Lisonbee et al., 2009) of helminthiasis particularly the nemathelminths Lastly, leaf meals (Giliricidia sepium inclusive) has inherent fibrous content that can simulate less nutritious diet and or nutrients deprivation used to force moult layers and at same time lower the incidence of salmonellosis caused by salmonella enterica serovar enteritidis (Landers, et al., 2005).In case there could be departure from normal supplementation response. Acamovic(2001) observed that reasons for apparent lack of response to enzyme supplementation could include the following;

i)The likelihood/possibilty of the diet being fed be of extremely good quality and allow the animals to performclose to their genetic potential.

ii)That enzymehas the incorrect mains pecificity (amylases,pectinases,β-glucanases,arabinoxylases,cellulases,hemicellulases,,acidproteases,alkalineproteases,phytases,esterases,lipases)and s attendant supplementary activity for the substrate.

iii)Denaturation of the enzyme before the dietis consumed,or supplementation of the diet with wrong enzyme.

iv)Variation within an ingredientsin the concentration or activity of proteinaceous antinutrients to the enzyme.

v)Variation in the quality of feed ingredients

vi)Animal stage of growth /maturity.

Furthermore, It must be emphasized ,however according to Bedford,.(2000) 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

4 Conclusion

From the above glricidia could be incorporated into the diet of the ration of layers apart from the fact that it is cheap ,perennial, easily esatablished,widely adapted to various soils and can also be enhanced nutritionally be enzyme supplementation which has synergistic effectively at 5% GLM level of inclusion as specified by the producer albeit it was original designed to MAXImize GRAIN based diets efficiency of utilization. It should be recommended for apparent reasons like free and natural carotene from xanthophylls of leaf meals which apart from increase the color and preference of the product by consumers, carotenoid will nurture the retina of the consumers eye and reduce cholesterol accumulation in the products of the hen feeding and will also be cardiac friendly to human beings consuming the hen products.

REFERENCE

A.O.A.C, (1995): Official method of Analysis (16th Ed.) Association of Official Analytical Chemists, Washington DC

Acamovic, T. Commercial application of enzyme technology for poultry production (2001) .World Poult. Sci. J., 57:226-242

Akinde T.O Adeyeri, MK, Longe , OG and Odunsi, A.A (2007)Response of laying chickens to graded levels of Tephrosia bracteolata leaf meal fed with soya bean or full fat soya bean meal L.R.R.D 19(8): 1 -9

Bedford, M,R.(2000) Exogenous enzyme in monogastric nutrition-their current value and future benefits. Anim Feed Sci & Tech: 861-73

Carew, B.A.R. (1983) Gliricidia sepium as a sole feed for Ruminants. Tropical Grassland, 17(4) 181-183.

Chadokar, P.A. (1982): Gliricidia maculata: A Promising Legume Forage Plant. World Ani. Rev, 44: 36-45

Fasuyi A.O (2007) Amaranthus cruentus leaf meal as a protein supplement in broiler finisher diet: Part 2 Hematological response, carcass characteristics and relative organ weights. AFJ AND Afr. J. Ag Ntrn. & Devt 7 (6) : 1- 14.

Ige, A.O., Odunsi, A.A., Akinlade, J.A., Ojedapo, L.O., Ameen, S.A., Aderinola, O.A. and Rafiu, T.A. (2006) Gliricidia Leaf meal in Layer's Diet: Effect on Performance, Nutrient Digestibility and Economy of Production. J. of As. Vet. Adv. 5(6): 483-486

Kim**,** J.T, Gillighan,J.T ,and Loadholt,C.B (1967) Difference in composition between crude fiber and acid detergent fibre.J.Ass.Off.Chem.50:340-343

Landers, K.L., Howard, Z.R., Woodward, C.L., Birthold, S.G. and Ricke, S.C (2005) Potential of alfalfa as an alternative moult induction diet for laying hens: egg quality and consumer acceptability Biors. Tech. 96; 907-911

Lisonbee , Larry D., Villalbai Juan. J. , Provenza, Fred. D, and Hall,Jeffrey O. (2009) Tannins and self-medication: Implication for sustainable parasite control in herbivores Behav. Prcs. 82:184-189

Marounek M. Skrivan, M., Dlouha, G:, and Brenova, N. (2008) Availability of phytase activity in the digestive tract of laying hens 20 and 47 weeks old. As. Fd . Sc. Tech 146:356-9.

Meng, Q.W., Yau, L. Ao, X., Jang, H.D., Cho, J.H and Kim 1.H. (2010) Effects of chito-oligosaccharides supplementation on Egg production, Nutrient digestibility, egg quality and blood profiles in laying hens. A/as. J.As. Sc 23 ;1476- 81

Odunsi. A.A., Ogunleke, M.O Alagbe ,O.S and Ajani, T.O (2002) Effect of feeding Gliricida sepium leaf meal on the performance and egg quality of layers Int. J Plt. Sc. (1): 26-8

Ogungbesan, A.M., Eniolorunda, O.O., Fasina, O.E., Taiwo, B.B.A. (2014)[a] Secondary plant metabolites utilization in West African dwarf does fed combined levels of Andropogon gayanus (Kunth) and Gliricidia Sepium (Jacq) with cassava offal based concentrate. Ame, J. of Res. Com., 2(5): 272-280 www.usa-journals.com,

Ogungbesan A.M., Adeleke, G.A, Fasina,O.E,and Adeyemi, K.A**.** (2014)[b] Effects of maxigrain supplemented Gliricida sepium (Jacq) leaf meal on performance characteristics and nutrients utilization in laying hens (Gallus gallus brizzen). Afric. J. & Sc & Res 3(3): 04-06)

Ogungbesan A.M., Fasina O.E., Lamidi, Akeem and Fajemisin, A.N.(2014)[c] Macro elements utilization in WA.D does fed combined levels of Andropogon gayanus (Kunthz) and Giliricida sepium (Jacq) with cassava offal based concentrate. A.J.L.E.X (in press).

S.A.S, (2002): Statistical Analysis Software. SAS.Ints.Inccary N.Y

Sams , R . Alan (2001) Poultry meat processing CRC Press Taylor & Francis Group, FL USA 345Pp

Yang, Y.X., Guo, J., Yoon, S.Y., Jin, Z., Choi, J.Y, Piao X.S, kim, B.W, OHH, S.J., Wang M.H and Chae, B.J (2009).Early energy and protein reduction: effects on growth , blood profiles and expression of gene related to protein and fat metabolism in broilers. Bri. Poul. Sc, 50 (2); 218-27

Zanu, H.K., Kagya–agyemang, J.K, and Avukpor, C.M. (2003) Effect of enzyme (XZYME) supplementation on the performance of laying hens fed diets containing different levels of cassava (Manihot esculenta, crantz) leaf meal. Online J. As & feed Res 3(1): 09 – 14.