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EFFECTS OF FEEDING *PENTACLETHRA MACROPHYLLA* LEAF MEAL DIETS ON THE PERFORMANCE AND EGG QUALITY CHARACTERISTICS OF LAYING HENS.

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ABSTRACT: An eighty four day feeding trial was conducted to determine the effects of leaf meals from *Pentaclethra macrophylla* as feed ingredients in laying hen diets. Four experimental layers diets were formulated, incorporating the leaf meal of *Pentaclethra macrophylla* at 0.00, 2.5,5.0, and 7.5% dietary levels. Eighty layers already 4months in lay were divided into four groups of 20 hens each and randomly assigned to 4 treatment diets and replicated into four replicates of 5 hens per replicate in a battery cage unit in a completely randomized design (CRD). There were significant (P>0.005) differences in the body weights of the treatment groups. The Haugh Unit, shell thickness, yolk index and albumin index were similar among the groups. Also the feed intake, feed conversion ratio and egg size had no significant (P<0.005) difference between the groups. However, the hen- day egg production was similar in all the treatment groups except for T_4(7.5%) which was significantly (p>0.005) lower. The egg yolk colour intensity increased as the *Pentaclethra macrophylla* leaf meal increased in the diets of the laying hens. The result of the study revealed that leaf meals from *Pentaclethra macrophylla* could be included in the diets of laying hens to enhance egg production and yolk colour intensity without any deleterious effects at 5% level of inclusion for optimum performance.

KEY WORDS: *Pentaclethra macrophylla* leaf meal, laying hen diets, egg quality, performance.

INTRODUCTION

The need for proper and adequate feeding of the various classes of livestock is necessary for sufficient and maximum production. The significance of protein and energy contents of the diets in the poultry industry can not be underestimated in a densely populated country like Nigeria where the high cost of feed for poultry threatens the expansion of the poultry industry. The main reason for this inadequacy and the increased cost of the poultry feedstuffs arises from increased competition between humans and livestock for the major feedstuffs such as maize, for energy, and soya bean and groundnut cake for the supply of protein and other needs of the poultry industry. So the need to develop a balanced and economical feed has led to the search for alternative sources of feedstuffs, which are not directly consumed by humans for monogastric animal production. Attention now is directed to indigenous plant species (herbs and shrub species) which serve as browse plants for ruminants.

Some of these browse plants not only supply the essential nutrients but also contain oxycarotenoid which positively affect the yolk and carcass of layers and broilers respectively (Udedibie, 1987; Udedibie and Opara, 1998; D'Mello *et al.* 1987; D'mello and Fraser, 1981; and Esonu *et al.* 2002). *Pentaclethra macrophylla* being one of these indigenous browse species is a very good fodder for small ruminants (sheep and Goat). *Pentaclethra macrophylla* is one of the few indigenous trees of a truly African origin. It is found growing in places like Central Africa, Nigeria, Senegal and Soa Tome. It is of great value to some 30 million people of South Eastern Nigeria who depend on the seed for food, timber, fuel and income (Okafor, 1980). The leaves have been observed to contain some medicinal properties and have been used as fodder for livestock production. However, no information on its use as a feed for non-ruminants despite the abundance of its highly greenish tufted and bunchy leaves that is available all the year round. Consequently, this study was carried out to investigate the possible implications of *Pentaclethra macrophylla* leaf meal feeding on the performance and egg quality characteristics of laying hens.

MATERIALS AND METHODS

The leaves of *Pentaclethra macrophylla* were harvested at the Imo State University, Owerri in the Southeastern agroecological zone of Nigeria. Only the greenish fresh leaves were harvested leaving the very tender and older coarse ones. The leaves were removed from the leave stalk to reduce the fibrous mess before spreading for sun drying. The leaves were dried for five days until they become crispy while still retaining their greenish colouration. The dried leaves were then milled using a hammer mill to produce a fine leaf meal. A sample of the leaf meal was taken to the laboratory and then subjected to the proximate analysis according to AOAC (1995) while the mineral analysis was carried out by the method of Grueling(1966) and the gross energy was determined with a Gallenkamp adiabatic oxygen bomb calorimeter (table 1).

Experimental diets.

Four experimental layers diets based on white maize were formulated such that Diets 1 (control) was the conventional concentrate layers diets which did not contain the leaf meal (*Pentaclethra macrophylla).* Diet 2 contained 2.5%, Diets 3 5.0% and Diets 4 contained 7.5% PMLM. The composition of the treatment diets are shown in table 2.

Experimental laying hens and design

A total of 80 Harco strain laying hens that was four months old in lay was used for the experiment. The laying

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hens were randomly divided into 4 experimental units of 20 hens each. Each of the groups was randomly assigned to an experimental diet in a completely randomized design (CRD). Each of the treatment groups was further divided into 4 replicates of five hens per replicate and each replicate was housed in a battery cage unit, measuring 33.6 cm x 45.7 cm x 40.6 cm.

Data Collection

The laying hens were weighed at the beginning and end of the experiment and feed and water was provided ad-libitum. Feed intake was recorded daily after a one-week pre-feeding trial period to get the hens accustomed to the experimental diets before the actual recording of the daily feed intake. Normal daily and rountine management practices and medication were followed appropriately. The feed intake was determined by subtracting the weight of left over of feed from the weight of feed offered daily.

Egg collection was done twice daily in the morning at 10:00 am and in the evening at 4:00 pm. Total number of eggs layed per treatment was recorded and six (6) eggs was collected from each treatment and used for the determination of the quality characteristics; Egg yolk colour intensity using the Hoffman la Roche scaled colour fan or chart (Vuilleumier, 1969) and the scores recorded. Other qualities determined were the yolk index, albumin index, shell thickness. Shell thickness was measured using a micrometer screw gauge (the membrane from each egg shell was first removed and measurements taken at three points on the shell and the shell thickness recorded was the average of the 3 points). The albumin and yolk heights and widths was measured using the venier calipers. The yolk and albumin indices and Haugh units were subsequently computed and recorded. The experiment lasted for 84 days.

Data Analysis

Data collected from the experiment, was subjected to one way analysis of variance according to Snedecor and Cochran (1978). Where analysis of variance indicated significant treatment effects, means were compared using Duncans New multiple Range Test (DNMRT) as outlined by Obi (1990).

RESULTS

The chemical composition of *Pentaclethra macrophylla* leaf meal (PMLM) is shown in table 1, while the chemical composition of the experimental diets is shown in table 2. Data on the performance and egg quality characteristics of the laying hens and the various treatment diets are presented in table 3. There were significant difference ($p>0.05$) in the body weight changes of the hens in T3 (5.0%) and T4 (7.5%). The percentage hen-day egg production had a significant difference ($p>0.05$) between T1(0%) and T4 (7.5%). The egg weight, feed intake and feed conversion ratio did not show any significant ($p<0.05$) difference among each other. However, there was a significant difference ($p>0.5$) between the control T1(0%) and the other treatment groups containing the *Pentaclethra macrophylla* leaf meal.

Table 1. Proximate Composition of *Pentaclethra macrophylla* leaf meal

Nutrients	% Dm
Dry matter (in air dry meal)	89.04
Crude protein	15.73
Crude fat	4.06
Ash	4.81
Crude fiber	21.87
Nitrogen free extract	42.63
Gross energy (mj/kg)	26.83
Mineral calcium	4.63
Magnesium	1.89
Sodium	2.01
Potassium	0.53
Phosphorus	0.33
Iron (fe)	2.0

DISCUSSION

The performance of the laying hens fed *Pentaclethra macrophylla* leaf meal was generally better in all the treatment groups. The feed intake in all the treatments containing the leaf meal were similar with that of the control group which contrasts other reports by Esonu *et al.* (2004), Odunsi *et al.* (2002), D'Mello *et al*.(1987), Udedibie and Opara, 1998, all of which indicated that due to the high fibre contents of the leaf meals, the feed intake of the poultry fed leaf meal diets were high to meet up the required energy levels for proper performance. The reason for the similarity in the feed intake in this work as reported herein could be as a result of the high metabolized energy contents of the *Pentaclethra macrophylla* leaf meal. Again the milling process, the meal was of a fine texture which also could increase the rate of intake, absorbtion and metabolization of the leaf meals in the diet.

Pentaclethra macrophylla leaf meal tends to contain a reasonable amount of mineral elements in adequate amount and these include Calcium, Phosphorus, Magnesium, Potassium and Iron which are required for proper performance including growth, development of shell and bone as well as egg formation and production (Admosun and Kalango, 1973; Fox and Feltwell, 1980; Fenimo *et al*. 1999 and Esonu *et al.* 2004).

The changes in the weight (increase or drop) of the laying hens was not unusual of laying hens as far as the changes in the weight does not affect the performance of the birds. The hen- day egg production did not differ significantly from the control in treatment T2 (2.5%) and T3 (5.0%) levels of inclusion of the *Pentaclethra macrophylla* leaf meal except for T4 (7.5%) which was 65.64%. even at this level of performance, the layers were above average performance and there was no indication of drop throughout the trial period.

For the egg quality characteristics, the Haugh unit was of the A grade (USDA 1958) standard grade in all the treatment groups. The egg shell thickness was similar in all the treatments and agrees with the values reported by Odunsi *et al*. (2002), Esonu *et al*. (2004) and the values reported by Oluyemi and Roberts, (1991), for the tropics.

Table 2. Ingredient composition of the treatment diets

	Dietary levels of Pentaclethra Macrophylla leaf meal (%)			
Ingredients	**T_1(0.00)**	**T_2(2.50)**	**T_3(5.00)**	**T_4(7.50)**
Maize (white maize)	45.00	45.00	45.00	45.00
Pentaclethra Macrophylla	-	2.50	5.00	7.50
Soya bean meal	15.00	14.00	13.00	12.00
Wheat offal	10.00	9.00	8.00	7.00
Brewers spent grain	10.00	9.50	9.00	8.50
Palm kernel cake	5.00	5.00	5.00	5.00
Fish meal	2.00	2.00	2.00	2.00
Blood meal	3.00	3.00	3.00	3.00
Bone meal	5.00	5.00	5.00	5.00
Lime stone	4.00	4.00	4.00	4.00
●Vitamin trace mineral premix	0.25	0.25	0.25	0.25
Common salt	0.25	0.25	0.25	0.25
L lysine	0.25	0.25	0.25	0.25
L- methionine	0.25	0.25	0.25	0.25
Calculated chemical composition (%Dm)				
ME (kcal/kg)	2697.32	2672.82	2630.80	2596.68
Crude protein	18.63	18.57	17.69	17.49
Crude fibre	5.68	5.91	6.01	6.21
Ether extract	4.63	4.57	4.23	4.11
Nitrogen free extract	69.11	68.93	68.81	68.53
Potassium	0.63	0.51	0.57	0.59
Total Ash	4.01	4.11	4.23	4.48
L Lysine	0.80	0.77	0.74	0.71
L-Methionine	0.31	0.30	0.33	0.29

● To provide the following per kg of feed: vitamin A, 1000 iu, Vitamin D3; 2000iu; Nicotinic acid 2.5 mg; Calcium pantothenate, 12.50mg; Vitamin B12. 2.5mg; Vitamin K3 2.3mg; Vitamin E 2.5mg; Cobalt 0.40mg; Biotin 0.50mg; Folic acid 1.00mg; Choline chloride, 25mg; copper 8.00mg; manganese 64mg; Iron, 32mg; Zinc,40mg;Iodine,0.8g;flavomycin, 100mg; spiromycin, 5mg; DL Methionine 50mg; selenium 0.16mg and L-Lysine 120mg.

Table 3: Effect of different dietary levels of *Pentaclethra macrophylla* leaf Meal on the performance of laying hens.

Parameters	**Dietary levels of Pentaclethra macrophylla meal %**				
	T_1 (0.00)	**T_2 (2.50)**	**T_3 (5.00)**	**T_4 (7.50)**	**SEM**
Av.Initial body weight (g)	1935.5	1867.5	1827.5	1735	3.04
Av. Final body weight (g)	1822.5	1857.5	1834.4	1770	3.0
Av. Body weight changes (g)	-13.0	-10.0	+6.9	+15.0	0.35
Av.Hen-day egg prod. (g)	77.50	72.61	75.61	65.64	0.59
Av. Egg weight	65.89	66.50	66.72	66.42	4.58
Av. Daily feed intake (g/d)	117.88	115.99	117.98	118.39	2.76
Feed conversion ratio (g/feed//g.egg)	1.79	1.74	1.77	1.78	3.10
Mortality	1	1	1	2	-

a, b means within a row with different superscripts are significantly ($P<0.05$) different.

The diets were thus presumed to support internal egg quality, calcium and phosphorus metabolism and shell deposition. The increase in yolk colouration indicated the presence of oxycarotenoid in the form of xanthophylls and ziaxanthin which is responsible for the yellow colouration of the beak, shanks, egg shell as well as egg yolk in poultry and the level of availability in the leaves will also show in the degree of pigmentation. Thus it appears that leaf meals from *Pentaclethra macrophylla* could be included in layer diets as it could reduce cost of production and enhance yolk colour pigmentation in the humid tropical countries without adversely affecting the performance of the laying hens.

The results of the trials reported herein showed that leaf meals from *Pentaclethra macrophylla* could be included in the diets of laying hens without any deleterious effects on the performance at levels up to 5.0% for optimum performance.

Further research is important in this regard to determine the phytochemical constituents of the leaf meal so as to improve the nutritive value for poultry considering the highly available tufted and tussock layers of this leaves all the year round.

Table 4: Effect of different dietary levels of *Pentaclethra macrophylla* leaf meal on the egg quality.

Parameters	Dietary levels of *Pentaclethra macrophylla* meal (%)				
	T_1 (0.00)	T_2 (2.50)	T_3 (5.00)	T_4 (7.50)	SEM
Shell thickness (mm)	0.36	0.35	0.34	0.35	0.3
Albumin Height (cm)	0.58	0.59	0.57	0.58	0.027
Albumin Diameter (cm)	9.013	8.95	9.37	9.08	0.2
Haugh unit	70[A]	70[A]	81[A]	75[A]	-
Yolk colour	1	3	4	4	-
Yolk Diameter (cm)	4.25	4.27	4.37	4.37	0.22
Yolk Height (cm)	1.63	1.65	1.68	1.64	0.04

"A" Haugh unit USDA (1958) standard egg grades.

REFERENCES

Ademosun, A.A. and Kalango, I.O. (1973). Effects of Calcium and phosphorous levels on the performance of layers feed intake and body weight. *Poultry Science*, 52:1383 1392.

AOAC. (1995), Association of official analytical chemist. Official method of analysis. Washington D.C.

D'Mello, J.P.F., T. .Acamovic and A.G. Walker. (1987). Evaluation of Leucaena leaf meal for broiler growth and pigmentation. *Trop. .Agric*. (Trinidad), 64: 33 35.

D'Mello, J.P.F and Fraser, K.W. (1981). The composition of leaf meal from *Leucaena leucophala*. Trop.Sci 23:75 -78.

Esonu, B.O., F.C. Iheukwumere, O.O.Emelalom, M.C Uchegbu and E.B. Etuk. (2002). Performance, nutrient utilization and organ characteristics of broiler finishers fed *Microdesmis puberula* leaf meal. *Livestock Research for Rural Development*. 14(16) 146.

Esonu, B.O., Azubuike, J.C., Ukwu, H.O. (2004). Evaluation of *Microdesmis puberula* leaf meal as feed ingredients in laying hen diets. *Int'l. Journal of Poultry science* 3(2):96 99.

Fanimo, A.O., A.B.J. Aina and E.B. Oguntona. (1999). Effect of different levels of *Tridax procumbens* on the performance of layers. *Nig. J. Anim*. Prod. 26: 53 -56.

Fox, S. and R. Feltwell. (1980). Practical poultry feeding. ELBS. Faber and Faber, pp. 75 80.

Grueling, H.T. (1966). The chemical analysis of tissues. Mimeo No.6622 Agronomy Dept., Cornell Univesity, Ithacn, New York,USA.

Obi, I.U. (1990). Statistical methods of detecting differences between treatment means. 2nd edn. Snaap Press, Enugu, Nigeria.

Odunsi, A.A., Ogunkele, M.O., Alagbe, O.S. and Ajani, T.O. (2002). Effects of feeding *Gliricidia sepium* leaf meal on the performance and egg quality of layers *Int'l. J. Poult. Sci.* 1(1):26 -28

Okafor, J.C. (1980). Edible indigenous woody tree plants in the rural economy of the Nigerian forest zone. *Forest Ecol. and Mgt*.,3: 45 55.

Oluyemi, J.A and Roberts, F.A. (1991).Poultry production in the warm wet climates.1st edn. Macmillan press Ltd., London.

Snedecor, G.W. and Cochran, W.G. (1978). Statistical Methods. Iowa State University Press, Ames Iowa, 6th Edn.

Udedibie, A.B.I. (1987). Comparative evaluation of leaf meal of paw paw *(C.papaya*), Jack bean (*C.ensiformis),* Sword bean *(C.gladiata)* and pigeon pea (*C.cayan)* as feed ingredients and yolk colouring agents in layers diets. *Nig. J. Anim. Pro*.14: 61 66.

Udedibie, A.B.I. and Opara, C.C. 1998. Response of Growing broilers and laying hens to the dietary inclusion of leaf meals from *Alchornia cordifolia*. *Anim. Fd. Sci. Tech*. 71:157 164.

USDA.1958. United States Standard for shell egg packs. Agricultural marketing service Agr. Hand book 145.

Vuileumier, J.P. 1969. The Roche yolk colour fan: Instrument for measuring yolk colour. Poultry Science, 48:767 -779.