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HAEMATOLOGICAL, SEROLOGICAL AND EGG BIOCHEMICAL PROFILE IMPLICATIONS OF FEEDING *JACARANDA MIMOSIFOLIA* LEAF MEAL DIETS TO LAYING HENS.

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ABSTRACT: Experimental diets were formulated to include *Jacaranda mimosifolia* leaf meal at 0%, 2.5%, 5.0% and 7.5% levels. This experiment was designed to determine the effects of Jacaranda mimiosifolia leaf meal diet on the haematological, Serological and egg biochemical profile of laying hens. 80 laying hens of the Harco breed in their 4months old into lay were divided into 4 treatment groups of 20 layers per group and randomly assigned to the 4 dietary treatments. The experiment was replicated 4 times and the experiment lasted for 77 days. The haematological values such as the haemoglobin, erythrocyte and leucocyte did not show any significant (P>0.05) difference but indices like the packed cell volume, increased significantly as the levels of *Jacaranda mimosofolia* leaf meal increased. Also other parameters like mean cell volume (MCV), mean cell Haemoglobin (MCH), and mean cell haemoglobin concentration (MCHC) all increased as the inclusion levels of the leaf meal increased. The serological values such as cholesterol, creatinine, urea and globulin were not significantly different but glucose, albumin and total protein showed a significant difference in the treatments containing Jacaranda leaf meal. The egg biochemical constituents were uniform for urea and cholesterol but significant differences were expressed as the levels of *Jacaranda mimosiofolia* increased in the treatment diets for total protein, albumin and globulin. The cost benefit analysis showed that the total cost of production was lower as the levels of the leaf meal increased. The total revenue and the Net income showed an optimal benefit uptill 5.0% while the 7.5% dropped though the drop was not low to keep the producer off production. *Jacaranda mimosifolia* could be included in laying hens diets for up to 5.0% level for optimal performance without any adverse effects in both the health and the production status of the hens.

KEY WORDS: Implication; feeding; *Jacaranda mimosifolia*; leaf meal; haematological; serological; egg biochemical profiles.

INTRODUCTION

The potentials of leaf meals in non-ruminant animal nutrition has been seriously emphasized. Considerable amount of research work have been done on the importance of a number of leaf meals from some indigenous legumes and browse plants in poultry nutrition such as *Mucuna pruriens* (Okorie, 2008b), *Pentaclethra macrophylla* (Okorie and Udedibie, 2008), *Leucaena leucocephala* Ipil ipil or koa hoale (Mateo *et al*. 1970; Vohra *et al*. 1972; D'Mello and Acamovic, 1989). Trials have also been conducted on Neem leaves, *Gliricidia sepium* and *Microdesmis puberula* (Esonu *et al*. 2005; Raharjo *et al*. 1987 and Esonu *et al*. 2002 and 2004).

Studies on the haematological and serum biochemical constituents of test animals revealed that leaf meals of browse plants and legumes enhanced all the blood parameters and improved the hen-day egg production at 7.5% level of inclusion. Similarly, the weight of the laying birds were also enhanced as the levels of inclusion of the leaf meals increased in the diets of laying hens ((Okorie, 2008a; Esonu *et al* .2004 and Odunsi *et al*. 2002).

Jacaranda mimosifolia is a highly tufted shrub. Most members of the family are found in South America. They climb by means of tendrils replacing terminal leaflets with large imparipinnate, opposite leaves that are also estipulate but the auxiliary buds may develop sufficiently to produce two tiny leaves low in the axils of the leaf. The flowers consist of a pseudostipules which may be mistaken for stipules and conspicuous *racemose* inflorescens of large brightly coloured flowers that are zygomorphic, followed by a very elongated 2 valves capsules in the central axis to reveal winged seeds. While closed, the fruit is reminiscent of a very long thin pod, but its internal structure and appearance once open are distinctive. The introduced species included *Jacaranda mimosifolia (*Jacaranda), *Tecoma stans* (Yellow tecoma) and *Begnonia capreolata* of South American Origin which is propagated by seedlings (Nielsen, 1965).

The present state of global food crisis and soaring prices have necessitated inward looking and research into the utilization of unconventional feedstuff as alternative to those feed ingredients which compete as food for man. The present study therefore seeks to evaluate the implication of inclusion levels of *Jacaranda mimosifolia* leaf meals in the diets of laying hens on the haematology, serum biochemistry and egg biochemical profile of laying hens. It is hoped that the resulting information will help reduce production cost of livestock and animal protein in the tropics.

MATERIALS AND METHODS

Processing of Leaves

The *Jacaranda mimosifolia* leaves used in this research were harvested in Owerri town in the rain forest agro ecological zone of Nigeria. The greenish fresh leaves were harvested leaving the very tender and older leaves. The leaves were sorted and removed from the leaf stalk before spreading for sun-drying for 7 days (one week) until the leaves became brittle and crispy while still retaining their greenish colour. The dried leaves were then milled after drying using a hammer mill to produce a fine leaf meal and then taken to the laboratory for proximate analysis in

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accordance with AOAC (1995). The gross energy was determined using the Gallenkamp adiabatic oxygen bomb calorimetric method (AOAC, 1995).

Table 1: Proximate Composition of *Jacaranda mimosifolia* Leaf Meal

Nutrients	Percentage Dry Matter (DM)
Dry matter (in air dry meal)	10.06
Crude protein	16.83
Crude fat	5.06
Ash	4.89
Crude fibre	21.84
Nitrogen free extractive	41.30
Gross energy (MJ/Kg)	42.83

Experimental Diets

Four experimental layers diet was formulated using white maize such that the control diet (diet 1) was the conventional concentrate layers diet, which did not contain *Jacaranda mimosifolia* leaf meal. Diet 2, 3 and 4 contained 2.5%, 5.0% and 7.5% of *Jacaranda mimosifolia* leaf meal. The composition of the experimental diets are shown in Table 2.

Experimental Laying Hens and Design

80 Harco laying hens at 4 months old in lay were used for the trial. 20 hens were randomly assigned to each of the 4 experimental diets in a completely randomized design. Each of the treatment groups was further replicated 4 times in a 4x4 = 16 experimental units of battery cage system, each measuring 33.6cm x 45.7cm x 40.6cm.

Blood Collection

The laying hens were weighed at the beginning and end of the experiment. Feed and water were provided ad-libitum. The feeding trial lasted for 77 days including a 7 day pre-test period to allow the hens adjust to the test feed. At the end of the feeding trial, the laying hens were bled between 9.00am and 10.00am. Two hens were selected at random from each replicate (a total of 8 hens per treatment) for bleeding. The bleeding was done via the punctured webal sub-clavical vein with a 5ml scalp vein needle set. 5ml of blood was collected from each hen into Bijou bottles containing ethylene diamine tetra acetic acid (EDTA) as an anti-coagulant for haematological assay. Also another 5ml of blood was collected from each of the hens into bottles without anti-coagulant and were used for serum biochemical assay.

Haematological Analysis

The blood samples collected from the hens were analysed within 3 hours of collection for total erythrocyte and leucocyte count. Haematocrit (PCV) and haemoglobin evaluation according to the methods described by Tuffery, (1995). Erythrocyte count (RBC) was done in a haematocytometer chamber. Total leucocyte count was obtained using a haematocytometer with NAtt and Henrick's diluent to obtain an 1:200 blood dilution. The number of leucocyte was thereafter estimated as total WBC/μL = number of cells of total WBC x 200. PCV was measured by the microhaematocrit method with 75 x 16mm capillary tubes filled with blood and centrifuged at 3000 rpm/5minutes. Hbc was also measured by the cyanmethemoglobin method. Various haematological indices like mean corpuscular haemoglobin (MCH), mean corpuscular volume (MCV) and mean corpuscular haemoglobin concentration (MCHC) were calculated from results obtained according to Jain (1986).

Blood Chemistry

The bottles of the coagulated blood were subjected to standard method of serum separation and the sera harvested was used for evaluation of total serum protein (TSP) and serum albumin (SA). Total serum protein was determined by the Golberg refractometer method to obtain concentrations (g/dl) for each blood sample (kohn and Allen, 1995), while albumin was determined using bromocresol green (BCG) method as described by Peters *et al*. (1982). Cholesterol (determined from fresh blood) and other biochemical assays such as creatinine and urea concentration were done following the method described by Baker and Silverton (1985).

Egg Chemistry

Three eggs were selected from each of the treatment groups for chemical analysis. The eggs were broken in a beaker and beaten to blend the albumin and the yolk. A sample of the egg homogenate was collected for analysis of urea, cholesterol, total protein, albumin and globulin using sigma kits while cholesterol was analysed according to Roschlan *et al.* (1974).

Data Analysis

Data collected on the haematological, serological and the serum biochemical constituents of the laying birds and eggs were subjected to one way analysis of variance (ANOVA) as outlined by Snedecor and Cochran (1978). Where analysis of variance indicated significant treatment effects, treatment means were compared using Duncans New Multiple Range test as outlined by Obi (1990).

The mathematical model for the one-way Analysis of Variance (ANOVA) is as follows

$$\text{CRD}, Y_{ij} = M + T_i + E_{ij}$$

Where

Y_{ij} = value of independent observations
M = unknown population variance
T_i = Treatment effects
E_{ij} = Error term

Table 2: Ingredient Composition of the Experimental Diets

	Dietary Levels of *Jacaranda* mimosifolia Leaf Meals			
	T_1(0.00)	T_2(2.50)	T_3(5.00)	T_4 (7.50)
INGREDIENTS				
Maize (white maize)	45.00	45.00	45.00	45.00
Jacaranda mimosifolia leaf meal	0.00	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 (PKC)	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)	2697.30	2672.82	2630.80	2596.68
Crude protein	18.63	18.67	17.69	17.49
Crude fibre	5.68	5.91	6.01	6.21
Ether extractive	4.63	4.57	4.23	4.11
Nitrogen free extractive	69.11	68.93	68.81	68.53
Potassium	0.49	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	0.31	0.33	0.29

* To provide the following per kg of feed: Vitamin A, 10,000iч; Vitamin D_3, 2000iч; Vitamin B_1, 0.75Mg; Nicotinic acid, 2.5Mg; Calcium panthothenate, 12.50Mg; Vitamin B_{12}, 2.5Mg; Vitamin K_3, 2.3Mg; Vitamin E, 2.5Mg; Cobalt, 0.40Mg; Biotin 0.50Mg; Folic acid, 1.1.00Mg; Cholin chloride, 25Mg; Copper, 8.00Mg; Manganese, 64Mg; Iron, 32Mg; Zinc 40Mg; Iodine, 0.8Mg; Flavomycin, 100Mg; Spiromycin, 5Mg; DL methionine 56Mg; Selenium 0.16Mg and L Lysine, 12Mg.

RESULTS

The result of the Haematological, serological and the egg biochemical profiles of the laying hens fed *Jacaranda mimosifolia* leaf meal diets are represented in Tables 3, 4, and 5 respectively while Table 6 shows the cost benefit analysis of *Jacaranda mimosifolia* leaf meal diets on laying hens. There was no significant difference in the haemoglobin concentration of the laying hens due to the inclusion levels of *Jacaranda mimosifolia* leaf meal in the treatment diets, though there was a rise in haemoglobin concentration as the levels of the leaf meal increases. The rise were however, not statistically significant. The packed cell volume showed a significant difference ($P< 0.05$) between treatments 3, 4 and treatment 1 (control). The red blood cell (erythrocyte) and white blood cell (Leucocyte) were statistically uniform amongst the treatment groups. The mean cell volume, mean cell haemoglobin and mean cell haemoglobin concentration showed significant difference ($P<0.05$) between the treatments as the level of the leaf meal increased in the experimental diets. The clotting time was statistically uniform in all the treatment groups.

Table 3: Haematological Composition of Laying Hens Fed Inclusion Levels of *Jacaranda mimosifolia* Leaf Meal Diets

VARIABLES	*DIETARY LEVELS OF JACARANDA MIMOSIFOLIA LEAF MEAL (%)*				
	T_1(0%)	**T_2(2.50%)**	**T_3(5.00%)**	**T_4(7.50%)**	**SEM**
Haemaglobin Hb(g/dl)	11.56	11.78	12.18	12.21	0.05
Packed cell volume Pcv(%)	34.73^{b}	35.33^{b}	36.26^{a}	36.65^{a}	0.16
Erythrocyte count. RBC ($X^{10\text{-}6}/_{uL}$)	8.76	8.51	8.69	8.61	0.43
Leucocyte Count WBC ($X^{10\text{-}6}/_{uL}$)	6.66	6.28	6.31	6.26	0.09
Mean Cell Volume MCV(fL)	37.54^{b}	38.29^{ab}	39.25^{a}	39.38^{a}	0.15
Mean Cell Haemoglobin (Pg)	10.66^{b}	15.63^{a}	15.23^{a}	15.23^{a}	0.15
Mean Cell haemoglobin Conc. (Pg)	31.75^{b}	32.30^{ab}	33.16^{a}	33.29^{a}	0.14
Clotting time (Secs)	8.76	8.10	8.10	8.07	0.09

a,b, means in the same row bearing different superscripts are significantly different (P<0.05). SEM = Standard Error Mean

The Serological indices showed that cholesterol and creatinine did not show discernible difference (P>0.05) among the treatments. The urea concentration was also not significant but glucose concentration, albumin concentration and serum total protein concentration showed significant (P<0.05) difference among the treatments as the levels of the leaf meal increased in the diets. Globulin concentration was uniform in all the treatment groups.

The biochemical constituents of the eggs from the laying hens revealed that both the urea and the cholesterol concentrations were identical in all the treatments. The egg total protein increased significantly (P<0.05) as the inclusion levels of *Jacaranda mimosifolia l*eaf meal increased in the experimental diets. Similarly, the albumin and globulin concentrations appreciated significantly (P<0.05) as the inclusion levels of the *Jacaranda mimosifolia* leaf meal increased.

Table 4: Serum Biochemical Indices of Laying Hens Fed Inclusion Levels of *Jacaranda Mimosifolia* Leaf Meal Diets

VARIABLES	*DIETARY LEVELS OF JACARANDA MIMOSIFOLIA LEAF MEAL (%)*				
	T_1(0%)	**T_2(2.50%)**	**T_3(5.00%)**	**T_4(7.50%)**	**SEM**
Cholesterol (Mg/dl)	38.26^{a}	38.44^{a}	38.29^{a}	38.38^{a}	0.13
Creatinine (Mg/dl)	17.85^{a}	18.26^{a}	18.26^{a}	18.4^{a}	0.17
Urea (Mg/dl)	2.94^{a}	3.10^{a}	3.05^{a}	3.08^{a}	0.03
Glucose (Mg/dl)	26.83^{b}	29.24^{a}	29.45^{a}	30.04^{a}	0.21
Albumin (g/dl)	17.93^{b}	24.08^{a}	24.15^{a}	24.20^{a}	0.05
Total Protein (g/dl)	77.45^{b}	82.0^{a}	82.23^{a}	83.64^{a}	0.14
Globulin (g/dl)	59.55^{a}	57.93^{a}	58.10^{a}	59.49^{a}	0.13

a, b, means in the same row bearing different superscripts are significantly different (P<0.05). SEM = Standard Error Mean

Table 5: Egg Biochemical Constituents of Laying Hens Fed Inclusion Levels Of *Jacaranda mimosifolia* Leaf Meal Diets

VARIABLES	*DIETARY LEVELS OF JACARANDA MIMOSIFOLIA LEAF MEAL (%)*				
	T_1(0%)	**T_2(2.50%)**	**T_3(5.00%)**	**T_4(7.50%)**	**SEM**
Urea (Mg/dl)	0.21	0.30	0.33	0.35	0.06
Cholesterol (Mg/dl)	4.15	4.43	4.50	4.63	0.09
Total Protein (g/dl)	26.65^{c}	31.10^{b}	32.60^{a}	32.93^{a}	0.18
Albumin (g/dl)	9.5^{c}	10.80^{b}	11.03^{b}	11.53^{a}	0.13
Globulin (g/dl)	17.15^{c}	20.30^{b}	21.57^{a}	21.40^{a}	0.14

a.b,c means in the same row bearing different superscripts are significantly different (P<0.05).
SEM = Standard Error Mean

The cost benefit analysis indicated cost reduction per kilogram of feed produced as the levels of the leaf meal increased in the experiment.

The feed intake per hen per day showed a significant drop as the levels of the inclusion of *Jacaranda mimosifolia* leaf meal increased. The Hen day egg production did not show any statistical difference between the control (T_1) and diets T_2 and T_3. However, a significant drop (P>0.05) was recorded for diet T_4. This was reflected in the average number of eggs produced per hen within the seventy (70) day trial which showed a marked decrease in T_4.

The cost implications showed that the total cost of production continued to decrease as the inclusion rate of the *Jacaranda mimosifolia* leaf meal increased in the diets of the laying hens. Consequently, the total revenue generated from the inclusion of *Jacaranda mimosifolia* leaf meal in the experimental diets increased significantly in the treatments containing the leaf meal at 5% and 7.5% levels.

The Cost Benefit Ratio (CBR), did not show any significant difference in all the treatment groups and the net income showed that 5.0% level recorded significantly (P<0.05) the highest Net income whereas the 0%, 2.5% and 7.5% levels did not show any significant difference in the net income generation.

The feed conversion ratio showed that 7.5% had the least feed conversion ratio of gram feed per gram egg produced. And the body weight changes was highest in 7.5% and 2.5% while 5.0% and 0% (control) had the least body weight change.

Table 6: Cost Benefit Analysis of Inclusion Levels of *Jacaranda mimosifolia* Leaf Meal Diets on Laying Hens

VARIABLES	*DIETARY LEVELS OF JACARANDA MIMOSIFOLIA LEAF MEAL (%)*				
	T_1(0%)	**T_2(2.50%)**	**T_3(5.00%)**	**T_4(7.50%)**	**SEM**
Cost of feed per kg feed produced ($)	0.382	0.380	0.36	0.35	0.10
Feed intake/Hen/day (gram/day)	117.88^{a}	113.67^{a}	115.36^{a}	108.73^{a}	0.73
Quantity of feed intake/Hen/70 days feeding trial (kg)	8.25^{a}	7.96^{a}	8.08^{a}	7.61^{a}	6.57
Hen-day egg production (%)	77.50^{a}	76.29^{a}	77.79^{a}	68.29^{b}	0.59
Average number of egg produced/Hen/70 days feeding trial	31.08^{a}	30.08^{a}	32.12^{a}	27.93^{b}	8.53
Cost of egg at $0.175/egg/70 days feeding trial ($)	5.41	5.23	5.59	4.86	3.09
Cost of feed required to produce the eggs/Hen/70 days feeding trial ($)	3.15	3.03	2.90	2.65	11.13
Total cost of production ($)	175.55	170.08	167.54	162.63	8.01
Total Revenue ($)	212.45	208.98	216.07	201.50	111.19
Cost Benefit Ratio (CBR)	0.812	0.814	0.775	0.807	0.07
Net income ($)	39.90	38.90	48.53	38.87	3.15
Feed conversion ratio (gf/gegg)	1.79^{a}	1.71^{a}	1.73^{a}	1.65^{b}	1.72
Initial body weight of the Hens (g)	1835.50	1887.50	1747.50	1802.50	3.04
Final body weight of the Hens (g)	1822.50	1775	1655	1695	3.0
Average body weight changes (g)	-13.0^{a}	-112.5^{c}	-92.5^{b}	-107.5^{c}	0.35

a.b,c means in the same row bearing different superscripts are significantly different (P<0.05).
SEM = Standard Error Mean

DISCUSSION

The result of the experiment revealed that there was no significant increase in the haemoglobin concentration of the hens attributable to inclusion levels of *Jacaranda mimosifolia* leaf meal. The level of haemoglobin concentration T_1(11.56), T_2(11.78), T_3(12.18), and T_4(12.21) g/dl, was within the range (7.0g 18.6g/dl) reported by Mitruka and Rawnsley (1977) in chicken. The result also agrees with the levels reported by Okorie and Udedibie (2008), in laying hens fed *Pentaclethra macrophylla* leaf meal. The packed cell volume (PCV), showed a significant increase as the levels of the *Jacaranda mimosifolia* leaf meal increased in the diet of the laying hens. This increase was probably due to the gradual increase in the haemoglobin concentration. Nevertheless, the Erythrocyte and leucocyte counts were not significantly different in all the treatment groups. The result of this experiment contrasts with other reports on leaf meals from tropical browse plants on the haematological assay probably due to the low chlorophyll in the plants or due to high fibre contents of leaves. (Okorie, 2006a; Iheukwumere *et al.* 2005).

The Mean cell volume (MCV), Mean cell haemoglobin (MCH) and Mean cell haemoglobin concentration (MCHC) were all increasingly significant as the inclusion levels of *Jacaranda mimosifolia* leaf meal increased in the experimental diets. The difference in the means of the cell haemoglobin, cell volume and haemoglobin concentration could be due to the increase per unit volume of the cells. The clotting time did not vary among the treatment groups.

The serum biochemical indices such as the cholesterol and creatinine concentrations did not vary among the treatment diets. This was also true of urea level. The glucose concentration increased as the levels of the leaf meal increased in the experimental diets. The reason could be that there was increase in carbohydrates retention resulting to increase in serum-glucose level since there was no high concentration of cholesterol and creatinine to interfere with the Glucose level. The serum albumin, total protein and globulin all increased as the level of the leaf meal increased in the experimental diet. These protein and protein components seem to justify the high protein contents as well as the quality of the protein in *Jacaranda mimosifolia* leaf meal (Okorie 2006b).

The insignificant difference in the urea and cholesterol concentration of the egg biochemical composition affirms the concentration of urea and cholesterol of the serum of the laying hens in the experimental groups. The total protein, albumin and globulin showed significant rise as the levels of *Jacaranda mimosifolia* increases in the treatment diets. This also was evident in the serum levels of the total protein, albumin and globulin indicates the levels and quality of protein in the Jacaranda leaf meal as well as the health status of the laying hens feeding on the Jacaranda leaf meal diets which was reflected in the eggs of the laying hens.

The cost of feed per kilogram of feed produced showed that the cost of producing a kilogram of feed continued to decrease as the levels of inclusion of *Jacaranda mimosifolia* increased. This could be due to the availability of Jacaranda leaves which is in less competitive demand. Feed intake dropped progressively as the level of Jacaranda leaf meal increased in the experimental diets. This contrasts with the earlier reports by Udedibie, 1988; Udedibie and Opara 1998), that due to the high fibre contents of leaf meals, the laying hens take in more feed to make up for their required energy. The reduced feed intake may probably be as a result of poor palatability of the Jacaranda leaf meal due to the caramel (tobacco like) odour of the leaf meal.

The total cost of production revealed that as the inclusion levels of Jacaranda leaf meals increased, the cost of production decreased. This could be due to the fact that every other cost of production remained constant for all the treatments but the cost of producing the feed. The total revenue cost was highest in T_3 (5.0%) and then the control T_1 and T_2(2.5%). This may be that at 5% level of inclusion of jacaranda, the birds performed at their optimum. This is true even when considering the performance of the birds, the blood and serological indices evaluation and Hen day egg production and feed intake. The cost benefit ratio (CBR) was almost similar in all the treatment groups which is an indication that even in 7.5% inclusion rate, the farmer can remain comfortably in production and "break even". The net income data showed that the 5.0% level of inclusion gave the highest return 48.53 Dollars.

The hen-day egg production showed that uptill 5.0% level of inclusion of Jacaranda leaf meal, the hen-day egg production was at optimum. Even though at 7.5% level, the hen-day egg production was low but still with good margin of economic advantage. This agrees with the report by Anyanwu 2002 which stated that only where the hen-day egg production dropped below 65%, the production could be said to be incapacitated for economic "break even". The average number of eggs produced during the 70 days trial period was significantly low in T4 (7.5%). The cost of producing an egg during the trial period was also low at the 7.5% level of inclusion.

The cost of feed required to produce the quantity of eggs in each of the treatments during the period of trial was significantly low in T_4 (7.5%) level. This was due to the lower feed intake of the laying hens which reflected in the hen-day egg production. Moreso, the feed conversion ratio which was measured in terms of gram feed per gram egg produced showed a significantly lower efficiency than any other treatment group. The Net income revealed that T_3 (5.0%) level gave the highest returns in monetary terms followed by the control Treatment$_1$, T_2 and then T_4 (7.5%) in all.

The production performance of the laying hens was above the average required to remain in production. The result of the experiment reported herein showed that *Jacaranda mimosifolia* gave the greatest performance and is recommended for inclusion in laying hens diets at 5.0% inclusion level for optimum performance without any deleterious effect on both the health and production performance of the hens.

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