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# Performance, haematological and serum biochemical profile of broilers chicken fed diets supplemented with *Ocimum gratissimum* meal

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**ABSTRACT**

**One hundred and fifty day old broiler chicks arbor acre strain were used in a seven weeks experiment to determine the effect of different levels of supplementations (0, 100, 200, 300 and 400 g per 100 kg) of *Ocimum gratissimum* leaf meal on the performance, haematology and serum biochemical profile of broiler chicken. The birds were divided into five dietary treatments. Each treatment was replicated trice with thirty birds per treatment in a completely randomized design. Data were obtained on the performance parameters such as body weight, feed intake, while feed conversion ratio and livability was calculated. Blood samples were collected for hematology and serum biochemistry. The result of the performance characteristics showed that there were significant differences (P<0.05) in the body weight and average feed intake of the birds, the values obtained ranged from 1904.40 – 2281.90 g and 4502.67 – 5033.54 g, respectively. The feed conversion ratio value ranged from 2.17 – 2.36. The result obtained for livability showed that there was significant difference (P<0.05) in the livability of birds on the control diet (80%) and those fed diet containing 400 g *O. gratissimum* (100%). Significant differences were observed in the values of packed cell volume (PCV), red blood cells (RBCs), white blood cells (WBCs), heterocytes, hemoglobin, cholesterol, glucose, aspartate transaminase and alanine transaminase. Hence inclusion of *O. gratissimum* in broilers diet at 300 gm/100 kg of feed in broilers gave the best result in terms of broilers health. It was concluded that the inclusion of *O. gratissimum* in the diets of broiler chicken has no detrimental effect on performance characteristics but improved the livability of the birds.**



## INTRODUCTION

Chicken meat is consumed by most people irrespective of tribe, race or religion. But poultry production is challenged by high cost of feeds and infection. Recently, there has been an increased research and awareness on ethnoveterinary medicines, which involve livestock diseases generally and poultry in particular. Although, high quality and adequate quantity of feed may be provided, the amount of feed digested, nutrient absorbed and utilized is very important. Generally, digestion in poultry may among other factors depend on the micro-organisms that naturally inhabit and colonize the digestive tract (Denli et al., 2003; Ndelekwute et al., 2012). This therefore highlights the need of formulating diets for its effect on gut health and function. Feed additives like antibiotics have been used for this purpose at sub-therapeutic doses in poultry diets (Enerberg et al., 2000). They act directly against pathogens in the gut

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creating a favorable environment for protein and energy digestion, absorption and metabolism (Puyalto and Mesia, 2002). Although, birds raised with these feed additives achieved good performance, the potential side effects which include host and cross drug resistance present a real public health concern globally (Al-Harthi, 2006) and has led to the ban of these products by many countries of the world (Cardozo et al., 2004; Kehinde et al., 2011). Some of these useful herbs and spices are indigenous to Africa and have been reported to influence nutrient utilization by chickens (Denli et al., 2003, Windisch et al., 2007). The search for "natural and safe alternative" drugs to reduce the cost of disease treatments/prevention and pest control in livestock production, which will safeguard public health has resulted to the introduction of many herbal products in livestock diets (Cardozo et al., 2004). Spices and herbal products have been found to be useful to man because of their nutritional and medicinal functions (Czarral and Fred, 2009). These products are beginning to gain ground in livestock production as more reliable orthodox drugs alternatives due to their low cost of administration, limited side effect and low residues on livestock products (kamel, 2001). Generally, digestion in poultry may among other factors depend on the micro-organisms that naturally inhabit and colonize the digestive tract (Denli et al., 2003; Ndelekwute et al., 2012). Some of these useful herbs and spices are indigenous to Africa and have been reported to influence nutrient utilization by chickens (Denli et al., 2003, Windisch et al., 2007). The search for "natural and safe alternative" drugs to reduce the cost of disease treatments/prevention and pest control in livestock production, which will safeguard public health has resulted to the introduction of many herbal products in livestock diets (Cardozo et al., 2004). Spices and herbal products have been found to be useful to man because of their nutritional and medicinal functions (Czarral and Fred, 2009). These products are beginning to gain ground in livestock production as more reliable orthodox drugs alternatives due to their low cost of administration, limited side effect and low residues on livestock products (kamel, 2001).

Spices and herbal products are in form of bulb, rhizome, knot and leaves, which improve foods palatability through their aroma, increase digestibility and impact some medical function when consumed by man or animals as part of their food (Tian, 2008), and enhance performance of broiler chickens (Carrijo et al., 2005; Odoemelam et al., 2012). Examples include *Alium salivium* (Garlic), *Piper nigrum* (Black pepper), *Ocimum gratissimum* (Scent leaf) and many others.

The use of antibiotics in livestock production has been a great concern to animal scientist as a result of their residue in tissue and this is of public health concerns, hence there is need to use natural herbal product in producing a healthier meat. In pursuit of improved broiler health and in order to fulfil consumer expectation in relation to food quality, poultry farmers include natural herbal materials in the diet of their birds (Gardzielewska et al., 2003). The medicinal value of these plants lies in bioactive phytochemical constituents that produce definite physiological action on the human body (Akinmoladun et al., 2007). They act by increasing the endogenous enzyme secretions. *O. gratissimum* belongs to the family Lamiaceae and found mostly in the tropical countries including: Nigeria, India, North and South America, Mexico and Brazil. It is traditionally used to relief pains and also used in the treatment of rheumatism, diarrhea, high fever, convulsions, diabetes, eczema, piles and as a repellant (Chitwood, 2003). It is used in the treatment of skin infections, gastroenteritis, stomachache, cuts, wounds, inflammation, and diuretic and also for hypertensive activities. It is also used against piles, diarrhea and hemorrhoid (Omotayo, 2007).

Hematological parameters and serum indices are those parameters that are related to blood, they are blood characteristics which affect both the health and nutritional state of an animal. The nutritional value of a feedstuff could therefore be reflected through parameters such as white blood cells (WBCs), red blood cells (RBCs), packed cell volume (PCV), hemoglobin, and lymphocyte. It is important for diagnosing conditions in which the number of blood cells is normal, high or abnormally low or the cells themselves are abnormal.

Hence, the objective of this work is to determine the effect of *O. gratissimum* on the performance (feed intake, body weight and feed conversion ratio, livability) hematology and serum biochemistry of broiler chickens fed various inclusion levels.

## MATERIALS AND METHODS

### Study site

This experiment was carried out at the Poultry unit of Babcock University farm, Ilishan-Remo, Ogun State. Ilishan-Remo is in the rain forest zone of Nigeria with an annual rainfall of 1500 mm. Ilishan is in the south west geo-political zone of Nigeria and falls on latitude of 6°54'N from the equator and longitude 3° 42' E from the Greenwich Meridian and the mean annual temperature is about 27°C.

### *Preparation of experimental leaf meal*

Fresh leaves of *O. gratissimum* were collected from Ilishan Remo, Ogun State, Nigeria. The leaves collected per time were air-dried, milled with hammer mill and bagged prior to use. The ground *O. gratissimum* was thoroughly mixed with the feed at the rate of 0, 100, 200,

300 and 400 g/100 kg respectively.

### *Management of experimental birds and layout of the experiment*

The house was washed, disinfected with Morigad disinfectant and left to air-dry for two weeks before the arrival of the chicks. Drinkers and tray feeders were thoroughly washed and disinfected before the arrival of Day old chicks. A total of one hundred and fifty (150) day old arbor acre strain of broiler chicks were purchased from a reputable hatchery in Ibadan, Oyo State, Nigeria. On arrival, the initial weights of the birds were taken before they were randomly allotted to five treatments ($T_1$, $T_2$, $T_3$, $T_4$, and $T_5$) with three (3) replicates of 10 birds per replicate in a completely randomized design. Feed and water were supplied to the bird's *ad-libitum* throughout the experimental period. Five dietary treatments were formulated. Treatment one ($T_1$) which is the control had no scent leaf meal while $T_2$, $T_3$, $T_4$ and $T_5$ had 100, 200, 300 and 400 g per 100 kg of feed respectively. Broiler starter was fed for three weeks while the finisher was fed for a period of four weeks.

### *Haematological and serological characteristics of the experimental birds*

At the end of the 7 week, 5 ml of blood samples were collected from 2 birds per replicate for hematological and serum biochemistry studies by the technique of John and Lewis (1991). The birds were bled by the wing vein using hypodermic needle with syringe. One into a container with ethylene diamine tetra acetic (EDTA) acid as an anti-coagulant while the other for serum collection had no anti-coagulant. The parameters measured were RBC, PCV, hemoglobin and WBC. Serum biochemical indices investigated include total protein, albumin, glucose cholesterol, creatinine levels, aspartate transaminase (AST) and alanine transaminase (ALT) enzyme activities.

### *Data collection and statistical analysis*

All data collected on performance and blood indices of broiler chicks were subjected to analysis of variance using SAS, statistical package, SAS (1999) and significant means were separated using Duncan multiple range test of the same software. Data were collected on performance characteristics (feed intake, changes in body weight, feed conversion ratio and survivability).

### *Feed intake*

Feed allotted to each replicate was weighed at 008 h any left-over was weighed at 008 h to obtain voluntary intake.

Feed intake = Feed offered - Left over feed

$$\text{Average feed intake/bird} = \frac{\text{Feed offered (g) - Feed leftover (g)}}{\text{Total number of birds in the group}}$$

### *Changes in body weight*

The gain in the body weight of experimental bird was recorded on weekly basis by subtracting the values of initial body weight in grams from final body weight.

Weight gain = Final weight - Initial weight

$$\text{Average weight gain/bird} = \frac{\text{Final weight (g) - Initial weight (g)}}{\text{Total number of birds in the group}}$$

### *Feed conversion ratio*

This was obtained by dividing the quantity of feed consumed by the weight gained. All the values obtained for the feed intake and live weight gain were used to obtain FCR.

$$\text{FCR} = \frac{\text{Total Feed Consume (g)}}{\text{Weight gain (g)}}$$

### *Survivability*

Survivability is the total number of broiler chicken that survived during the experiment. It was expressed in percentage (%).

$$\text{Survivability (\%)} = \frac{\text{Number of survived birds}}{\text{Total number of birds}} \times 100$$

## RESULTS

Table 1 shows the proximate analysis of *O. gratissimum* leaf meal. The dry matter content is 77.50 g/100. The ash content is 1.31 while the crude fibers, crude protein value content are 1.04% and 4.50% respectively. The test ingredient also contains tannin which is the antinutitional factor in the leaf meal of *O. gratissium* content. Tables 2 and 3 indicate the composition of the broiler starter and finisher diets. While Table 4, shows the performance characteristics of birds fed *O. gratissimum* leaf meal supplemented diet. There was significant difference ($P<0.05$) in the average feed intake of the birds fed with

**Table 1.** Proximate composition and Tannin content of *O. gratissimum* leaf meal.

| Variables | Amount/100 g |
|---|---|
| Moisture content | 22.50 |
| Dry matter content | 77.50 |
| Ash content | 1.31 |
| Crude fibre content | 1.04 |
| Crude protein content | 4.50 |
| Nitrogen free extract | 12.95 |
| Percentage tannin | 3.20 |

**Table 2.** Gross composition of experimental broiler starter diet.

| Ingredients | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ |
|---|---|---|---|---|---|
| | - | 100 g | 200 g | 300 g | 400 g |
| Maize | 50.50 | 50.50 | 50.50 | 50.50 | 50.50 |
| Groundnut cake | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| Soya bean meal | 30.00 | 30.00 | 30.00 | 30.00 | 30.00 |
| Fish meal (72%) | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Wheat offal | 7.30 | 7.30 | 7.30 | 7.30 | 7.30 |
| Bone meal | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 |
| Salt | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Vitamin premix | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Lysine | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Methionine | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Limestone | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| **Calculated analysis** | | | | | |
| Crude protein (%) | 22.58 | 22.58 | 22.59 | 22.59 | 22.60 |
| Metabolisable energy (Kcal/Kg) | 2869.88 | 2869.88 | 2869.88 | 2869.88 | 2869.88 |

**Table 3.** Gross compositions of experimental finisher diets.

| Ingredients | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ |
|---|---|---|---|---|---|
| | - | 100 g | 200 g | 300 g | 400 g |
| Maize | 55.00 | 55.00 | 55.00 | 55.00 | 55.00 |
| Groundnut cake | 3.80 | 3.80 | 3.80 | 3.80 | 3.80 |
| Soya bean meal | 30.00 | 30.00 | 30.00 | 30.00 | 30.00 |
| Fish meal (72%) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Wheat offal | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| Bone meal | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 |
| Salt | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Vitamin premix | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Lysine | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Methionine | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Limestone | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| **Calculated analysis** | | | | | |
| Crude protein (%) | 21.36 | 21.36 | 21.37 | 21.37 | 21.38 |
| Metabolisable energy (Kcal/Kg) | 2921.12 | 2921.12 | 2921.12 | 2921.12 | 2921.12 |

**Table 4.** Performance characteristics of birds fed *O. gratissimum* leaf meal supplemented diet.

| Parameters | Treatments (g) | | | | | SEM |
|---|---|---|---|---|---|---|
| | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | |
| | 0 g | 100 g | 200 g | 300 g | 400 g | |
| Initial weight (g/bird) | 40.56 | 40.44 | 40.44 | 40.56 | 40.56 | 0.25 |
| Average feed intake (g/bird) | $5033.54^{a}$ | $4603.16^{b}$ | $4550.93^{b}$ | $4581.00^{b}$ | $4502.67^{b}$ | 13.30 |
| Body weight gain (g/bird) | $2281.90^{a}$ | $2043.30^{ab}$ | $2060.00^{ab}$ | $2110.00^{ab}$ | $1904.40^{b}$ | 5.64 |
| Feed conversion ratio | 2.21 | 2.25 | 2.21 | 2.17 | 2.36 | 0.06 |
| Liveability % | $80.00^{b}$ | $96.67^{a}$ | $96.67^{a}$ | $93.33^{a}$ | $100.00^{a}$ | 1.22 |

**a b and c,** Means along the same row with different superscript are significantly different (P<0.05).

**Table 5.** Hematological parameters of broilers fed *O. gratissimum* leaf meal supplemented diets.

| Parameters | Treatments | | | | | SEM | STD |
|---|---|---|---|---|---|---|---|
| | $T_1$ (0) | $T_2$ (100) | $T_3$ (200) | $T_4$ (300) | $T_5$ (400) | | |
| PCV (%) | 30.50 | 33.47 | 33.50 | 35.83 | 35.67 | 0.85 | 22-35 |
| RBC ($mm^3x10^6$) | $3.12^{b}$ | $3.22^{ab}$ | $3.24^{ab}$ | $3.25^{ab}$ | $3.35^{a}$ | 0.17 | 2.0-4.0 |
| WBC ($mm^3$ $x10^3$) | $18.10.^{c}$ | $18.35^{c}$ | $18.50^{c}$ | $18.99^{b}$ | $19.45^{a}$ | 1.87 | 9.2-31 |
| Lymphocyte (%) | 62.83 | 58.83 | 62.83 | 61.20 | 62.80 | 0.96 | 47-81 |
| Monocytes (%) | 2.50 | 2.67 | 4.00 | 3.30 | 3.60 | 0.42 | 3.3-9 |
| Eosinophil's (%) | 3.17 | 3.17 | 3.67 | 3.00 | 2.17 | 0.59 | 2.2-6 |
| Basophils (%) | 0.50 | 0.33 | 0.17 | 0.33 | 0.33 | 0.29 | 0.5-1 |
| Heterocytes (%) | $32.50^{ab}$ | $37.33^{a}$ | $31.83^{b}$ | $33.00^{ab}$ | $29.50^{b}$ | 0.97 | 16-33 |
| Hemoglobin (g/dl) | $10.28^{ab}$ | $10.08^{ab}$ | $11.07^{ab}$ | $9.90^{ab}$ | $11.58^{a}$ | 0.50 | 7-13 |

**a, b and c,** Means along the same row having any identical superscript are not significant (p>0.05); **SEM,** standard error of mean; **STD,** standard range.

experimental diet, $T_1$ having the highest value (5033.54 g) while $T_5$ having the lowest value (4502.67 g). Also, significant difference (P<0.05) were observed in the body weight of the birds fed with experimental diet, $T_1$ having the highest value (2281.90 g) while $T_5$ having the lowest value (1904.40 g). In the result obtained for livability there was significant difference (P<0.05) between treatment $T_1$ (80%) and $T_5$ (100%). The feed conversion ratio (FCR) value ranges from 2.17 – 2.36. Table 5, depicts the hematological parameters of broilers fed *O. gratissimum* leaf meal based diets. The PCV ranged from 30.50 – 35.83 while the value obtained from RBCs ranged from 3.12 – 3.35. The lowest value of WBCs was obtained from the birds fed diet containing 20% inclusion of *O. gratissium* (13.00) while the highest value was obtained from the birds fed 5% (18.35). The values obtained for monocytes and hemoglobin were also significantly different (P>0.05). While the values obtained for lymphocytes, eosinophil and basophiles were not significantly different. The values obtained from Table 6 showed that serum total protein, albumin and creatinine levels were not significantly different while significant differences were obtained in the cholesterol, glucose levels AST and ALT enzyme activities.

## DISCUSSION

The result of the proximate composition of *O. gratissium* obtained in this experiment is similar to that obtained by several authors that have analyzed the composition of *O. gratissimum* leaf meal. Belewu et al. (2009) reported proximate analysis of *O. gratissium* to be 93.33% dry matter, 21.33% of moisture, 20.78% crude protein, 11,75% fat, 14.99% crude fiber and 3.58% ash. While Fagbohun et al. (2012) reported the proximate composition of *O. gratissimum* leaves as follows; 5.11 - 7.77% ash, 5.04 – 6.54% moisture, 14.6 – 19.30% crude protein, 6.80 – 7.57% fat, 9.61 – 12.66% crude fiber and 50.08 – 56.16% nitrogen free extract. Adewole et al. (2013) presented the proximate composition of *O. gratissimum* as follows; 10.30% moisture, 2.45% ash, 2.18% fat, 16.51% protein, 9.07% crude fiber and 58.89% nitrogen free extract. The ash content of *O. gratissimum*

**Table 6.** Serum biochemistry of broilers fed *O. gratissimum* leaf meal supplemented diets.

| Parameters | $T_1$ (0) | $T_2$ (100) | $T_3$ (200) | $T_4$ (300) | $T_5$ (400) | SEM | STD |
|---|---|---|---|---|---|---|---|
| Total protein (g/dl) | 2.86 | 2.97 | 2.87 | 2.84 | 2.98 | 0.40 | 5.20-6.90 |
| Albumin (g/dl) | 1.29 | 1.17 | 1.35 | 1.72 | 1.59 | 0.32 | 2.10-3.45 |
| Cholesterol (mg/dl) | $98.40^{a}$ | $81.86^{c}$ | $80.03^{c}$ | $72.15^{d}$ | $90.37^{b}$ | 1.03 | 52.0-148.0 |
| Creatinine (mg/dl) | 0.99 | 0.97 | 0.90 | 0.85 | 0.85 | 0.19 | 0.90-1.85 |
| Glucose (mg/dl) | $185.31^{b}$ | $227.65^{a}$ | $162.23^{c}$ | $158.14^{c}$ | $165.31^{b}$ | 1.46 | 152-182 |
| AST (%) | $12.24^{bc}$ | $15.00^{a}$ | $14.12^{ab}$ | $11.40^{c}$ | $9.77^{c}$ | 0.72 | 8.8-20.8 |
| ALT (%) | $9.44^{c}$ | $9.67^{c}$ | $11.12^{bc}$ | $13.49^{a}$ | $13.20^{a}$ | 0.63 | 9.5-37.2 |

**a, b and c,** Means along the same row having any identical superscript are not significant (p>0.05); **SEM,** standard error of mean; **STD,** standard range.

obtained in this study is low and this is a reflection of the amount of mineral elements present in the leaf – meal. The differences in the proximate composition of *O. gratissimum* as reported by different authors may be due to the differences in the preparation method of the leaf meal or the soil type, which affected the moisture and the ash contents.

As the level of inclusion of *O. gratissimum* in the diets increased, the values of crude protein (CP) were not significantly affected in the diet. This is due to the fact that the test ingredient has about 4.50% crude protein. The gross composition shows that all the parameters fall within the recommended value for broilers starter and finisher according to Oluyemi and Robert (2000).

There were significant differences in the average feed intake of the birds. The highest average feed intake was obtained from the control diet (5033.54 g) while the least average feed intake (4502.67 g) was obtained for diet containing 400 g *O. gratissimum*. The result obtained shows that as the level of inclusion of *O. gratissimum* increases, the feed intake reduces; this may be due to reduced acceptability of the feed or inability of the broilers to handle the anti-nutritional factors in the *O. gratissimum*. The feed intake values are in accordance to the recommendations for broilers (Oluyemi and Robert, 2000).

The feed conversion ratio (FCR) value ranges from 2.17 – 2.36 which falls within the recommended value for broiler birds. The values obtained here were above the optimum value of 2.0 for broilers by Prabakaran (2003) but were however better than the range (4.0 – 5.0) reported by Uko and Kamalu (2008). This shows that the inclusion of *O. gratissimum* in the diet of experimental birds do not have any deleterious effect on the feed consumption of the birds.

Also, in the result obtained for livability there was significant difference ($P<0.05$) between treatment $T_1$ (80%) and $T_5$ (100%). This shows that as the inclusion of *O. gratissimum* increases in the diet, the mortality reduces and one can infer that 400 g inclusion of the test ingredient in the diets of broiler birds is of great benefit in promoting livability of the stock. This may be attributed to some of the phytochemical that the test ingredient possess, for example: tannin (Onajobi, 1986).

The result for the PCV, lymphocyte, monocytes, eosinophils and basophiles are not significantly different, however significant differences were observed in the values obtained for RBCs, WBCs, better heterophils and haemoglobin. There is an increase in the level of PCV as the level of inclusion of the test ingredient increased, although not significantly different. The lowest value was obtained from the birds fed with the control diets (30.50%) while the highest value was obtained from birds on diet E (35.67%). PCV is involved in the transport of oxygen and absorbed nutrients. This indicates that the experimental birds fed with the test ingredients are not anaemic. Increased PCV shows a better transportation and thus prevents anaemia (Coles, 1986). This result was also in line with the report of Chineke et al. (2006) which states that PCV readily indicated an increase in the number of RBCs or reduction in circulatory plasma volume. The result of PCV and haemoglobin which increases as the inclusion level of garlic increase in the diets is in accordance with Adejumo (2004) who reported that PCV and haemoglobin were positively correlated with the nutritional status of animal.

The RBC and the WBC value obtained in this study significantly increased as the level of inclusion of scent leaves increased. The difference observed in the WBC values of birds implies differences in the intrinsic body defence system (Ganomg, 1991). This implies that the birds treated with 400 g of *O. gratissimum* have the highest immunity while the lowest was obtained from the control diet with 0% *O. gratissimum*. This is further collaborated by the higher lymphocyte count of the birds on these diets compared with the control diet. It has been reported that toxic substances in feed tends to suppress haemopoietic tissues with consequent lower production of WBCs. This observation however implies that the diets supported haemopoietic tissue with production of

adequate WBCs. Thus result indicated that the immune system of the birds were not compromised because the WBCs function primarily as defence system in the body (Eroschenko, 2000) values obtained for monocytes, eosinophils, basophiles and heterocytes are within the normal range for healthy birds (Mitruka and Rawsley, 1977; Archetti et al., 2008).

The low values of monocytes and basophils agreed with the statement that basophils and monocytes are normally present in small to moderate number in the blood system. The values obtained for the haemoglobin in this study did not really follow any particular trend, although significant difference was observed.

No significant differences (P>0.05) were observed in the values obtained for birds fed with the experimental diets on the following parameters: total protein, albumin and creatinine, except for cholesterol, glucose, AST and ALT. The non-significant effect of experimental diets on the total protein and albumin of the birds indicate the ability of the diets to support production of these blood components.

Total protein and creatinine contents have been shown to depend on the quantity and quality of dietary protein (Iyayi and Tewe, 1998; Esonu et al., 2001). The values obtained for albumin in this study were lower than the recommended value from Mitruka and Rawsley (1977). The cholesterol level in this study was not significantly affected by the dietary treatment and no specific pattern was observed for the cholesterol value. However, values are within the range of normal healthy chicken (Mitruka and Rawsley, 1977).

Creatinine had values ranging from 0.85 – 0.99 mg/dl. The control diet had the highest creatinine value of 0.99 mg/dl while the least value (0.85 mg/dl) was obtained from birds on $T_5$. This implies the nutritional superiority of the protein quality (Aning et al., 1998). Creatinine is also linked with muscle wasting as a result of excess creatinine in the blood of animals due to catabolism (Bell et al., 1992); this is ruled out in the present study. The values obtained for glucose in this study ranged from 158.14 – 227.65 mg/dl.

AST and ALT (IU/L) values were significantly different among the dietary groups. The values obtained for AST and ALT were within the recommended value for chicken by Mitruka and Rawsley (1977). The result obtained from the AST obtained from the birds fed experimental diets did not follow any particular trend, although the concentrations are within the normal range of 8.80 – 20.8% reported for chicken (Mitruka and Rawsley, 1977). An increase in serum AST and ALT above normal range has been reported to signify necrosis and myocardial infection or response to the presence of toxic factors. From the results there is clear evidence that the test ingredient compared favourably in all serum biochemical indices evaluated.

Generally, the birds fed diets containing *O. gratissimum* leaf meal were not influenced negatively in their performance. The haematology and serum biochemistry were not significantly influenced.

## CONCLUSION AND RECOMMENDATION

This study has revealed that the inclusion of *O. gratissimum* in the diets of broiler chicken has no detrimental effect on performance profile. However, the inclusion of *O. gratissimum* in the diet of broiler chicken at the rate of 300 g/100 kg feed improved the livability of the birds and at the same time improves feed conversion ratio of broilers and overall health of the birds.

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