

Haematological Studies of Broilers (1-28 Days) Fed with Diet Containing Varying Proportions of *Tithonia Diversifolia* Leaf Protein Concentrate

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Abstract:- A feeding trial lasting for 28 days was conducted, involving 150 days old chicks which were randomly allocated to five dietary treatment with 3 replicate, of ten birds per replicate. The experimental diets consisted of 0%, 5%, 10%, 15% and 20% inclusion level of *Tithonia Diversifolia* (wild sunflower) leaf protein concentrate to determine the effect of different level of *Tithonia Diversifolia* leaf protein concentrate on Haematological parameters of the birds. Haematological studies carried out were packed cell volume (PCV), Haemoglobin concentration (Hb), Red blood cell (RBC), white blood cells, Alanine aminotransferase (ALT), Aspartate aminotransferase (AST), Mean Corpuscular Haemoglobin Concentration (MCHC), Mean Corpuscular Haemoglobin (MCH), Mean Corpuscular Volume (MCV) and Total protein, Albumin, Cholesterol. Packed Cell Volume obtained for the experimental bird varied significantly to each other with diet 3 having the highest value of 29.7 ± 2.52 which was significantly different ($p < 0.05$) to the value obtained for diet 1, 2 and 5. White blood cells values of 86.33 ± 185 at 10% level of *Tithonia diversifolia* leaf protein concentrate was the highest while diet 1 and 2 had the lowest. The highest cholesterol values was obtained from diet 1 and 4 with an average value of 5.37 ± 0.47 and 5.20 respectively while the lowest cholesterol value was obtained from diet 3 which had 4.16 ± 0.33 . The highest total protein value of 29.1 ± 0.15 was obtained at 10% inclusion level of *Tithonia diversifolia* leaf protein concentrate while the lowest values was seen on birds in diet. Feed in take value of birds on diet 3 with 10% inclusion level of *Tithonia Diversifolia* leaf protein concentrate was 99.8 ± 1.52 which is similar to diet 1 and 5 while the lowest feed intake was observed in birds at diet 2 having 94.1 ± 6.85 the birds on diet 3 (10% inclusion level) showed the highest weight gain followed by birds on the control diets. The result shows that 10% inclusion of *Tithonia Diversifolia* leaf protein concentrate could be used without having any deleterious effect on the broiler chicks.

Keywords:- Broilers; Heamatology; Protein Concentrate; Blood Chemistry; *Tithonia Diversifolia*.

I. INTRODUCTION

Tithonia diversifolia which is a common weed in the tropics and is of little or no economic value to man which farmers spend a lot of money for their control. If broilers

accept this weed, it will help the farmers to maximize profit as cost of production would be reduced and also there will be an increase in the level of supply and consumption of animal protein per head in Nigeria. Globally, broiler chickens are produced commercially to meet the ever increasing demand for animal protein in the diet of man (10). They are fast growing chicken which are genetically modified for tender meat production especially where there is a desire for such table meat (21). Chicken meat is consumed by all categories of people, irrespective of economic or social status except by vegans and vegetarians. It is a protein source of high biological value, having all the essential amino acids needed by the human body. It is rich in iron (in a readily absorbable form), selenium, zinc, and an excellent source of B- complex vitamins (22). This study therefore aimed at investigating the effect of feeding varying proportions of *tithonia diversifolia* leaf protein concentrate on haematological parameters and blood chemistry of broilers. When TDLP is included in their feed in an attempt to reduce feed cost in broiler production programmes.

II. MATERIALS AND METHOD

A. Experimental Diets and Birds

The experiment was carried out at the Teaching and Research farm of the Ekiti- state University, Ado-Ekiti and the experiment lasted for four weeks. *Tithonia diversifolia* (Mexican sun flower) was harvested from different location at the Ekiti-state University. *Tithonia* was harvested before their flowering stage, weighed, chopped, soaked in water, milled and pressed in a sack to remove the juicy content from the residue. The juicy content was sieved and heated to a temperature of about 80°C , the coagulation formed on top of the heated juicy content which is the leaf concentrate protein collected, sieved and sundried. A total number of 150birds (A day old) were purchased from reputable hatchery and every other management procedures were fully observed. The birds were watered and fed adlibitum throughout the experimental period. The birds were weighed weekly and their feed intake was also known.

B. Experimental Design

The experimental design adopted for the investigation was completely randomized design with 150 day old broiler chicks which was completely randomized to five treatments (diets) each treatment was replicated thrice with 10birds per replicate.

C. Collection of Blood

At the end of the feeding trial, the birds were starved overnight, randomly selected for the collection of blood. The birds were injected with perforated syringe to collect blood from their jugular veins. The blood was collected into a vial containing ethylene di-aminetetra acetic acid (EDTA) which acted as a protector to the blood from coagulation or which are prevent coagulation. The blood collected was taken to the laboratory for analysis.

D. Determination of Haematological Parameters

Packed cell volume was determined by the micro-haematocrit method (Dacie et al 1991), the haemoglobin content in the blood of each replicate taken was estimated using cyame thaemoglobin method, and white blood cell was estimated using the improved neubaver haemocytometer method as described by (14) and the red bold cell was determined using normal saline or formulation as the diluting fluid. The red blood cell count was determined by

haemoglobin method as described by Lamb (1981). Mean corpuscular haemoglobin concentration (MCHC), mean corpuscular haemoglobin (MCH), and the mean corpuscular volume (MCV) are referred to as absolute values, absolute values were computed according to (13), and their values were calculated from the result of the red cell count. Haemoglobin concentration (Hb) content and packed cell volume (pcv) and have been widely used in the classification of anaemia with full automatic counting system. Absolute values were estimated simultaneous with the cell count.

$$MCHC = \frac{Hb (g/100cm^3) \times 100}{PCV}$$

$$MCH = \frac{Hb (g/100cm^3) \times 100}{RBC}$$

$$MCV = \frac{PCV \times 10(\mu^3)}{RBC}$$

Table 1 Composition of Experimental Diets (Kg)

| Inclusion level of Tithonia Diversifolia. | | | | | |
|---|-----------|-----------|-----------|-----------|-----------|
| Ingredients | T1 | T2 | T3 | T4 | T5 |
| % Tithonia.d | 0% | 5% | 10% | 15% | 20% |
| Maize | 53.35 | 53.35 | 53.35 | 53.35 | 53.35 |
| Soya beans | 20 | 19.3 | 18.53 | 17.76 | 16.99 |
| G.N.C | 13 | 13 | 13 | 13 | 13 |
| Fish meal | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Wheat meal | 4.90 | 4.90 | 4.90 | 4.90 | 4.90 |
| Bone meal | 2.60 | 2.60 | 2.60 | 2.60 | 2.60 |
| Oyster shell | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| Methionine | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| Premix | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Salt | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| T diversifolia | 0 | 0.7 | 1.47 | 2.24 | 3.01 |
| Total | 100 | 100 | 100 | 100 | 100 |
| ANALYSED VALUES | | | | | |
| C. PROTEIN (%) | 23.20 | 23.44 | 23.20 | 23.10 | 23.03 |
| ASH (%) | 11.05 | 8.28 | 12.86 | 9.72 | 8.35 |
| M. CONTENT (%) | 15.73 | 12.10 | 10.59 | 12.39 | 12.96 |
| FAT (%) | 3.58 | 4.22 | 3.56 | 3.63 | 4.38 |
| FIBRE (%) | 3.59 | 3.73 | 3.53 | 3.54 | 3.63 |
| CHO (%) | 42.35 | 47.89 | 46.26 | 47.58 | 47.65 |
| Proximate composition of Leaf protein concentrate of Tithonia Diversifolia | | | | | |
| MC (%) | ASH (%) | CF (%) | EE (%) | CP (%) | NFE (%) |
| 9.53 | 7.20 | 2.50 | 3.86 | 35.44 | 41.42 |

E. Blood Chemistry

At the end of the feeding trial, the birds were starved overnight, randomly selected and weighed. Blood was withdrawn from the birds using syringe. Jugular vein of the birds was the suitable site for collection. The blood was taken to the laboratory for analysis. Albumin was determined by mixing 4mls of bromocresol green reagent with 20µl of diluted water at a standard and test of 20µl allowed to stay for five minutes at room temperature. Reading was taken at 630nm in the spectrophotometer and Total protein 4mls of a burette reagent is mixed with 50µl of diluted water at a standard and test of 50µl was mixed and allowed to stay for 30minutes at a room temperature. Reading was taking at 54minutes in the spectrophotometer.

F. Data Collection

Blood sample collected prior was taken for laboratory analysis, and data were collected in packed in cell volume(PCV),HBC(Haemoglobin concentration), WBC(white blood cell), MCH (Mean Corpuscular Haemoglobin concentration), mean cell volume (MCV), Mean Corpuscular Haemoglobin (MCH), Total protein, Cholesterol, Albumin etc.

G. Statistical Analysis

All the data were subjected to statistical analysis using variance (Anova), and the mean was determined using Duncan's multiple range test (DMRT)

III. RESULTS AND DISCUSSION

Table 2 Results and Discussion

| Haematological Parameters of the Experimental Birds | | | | | |
|---|--------------------------|--------------------------|---------------------------|--------------------------|--------------------------|
| PARAMETERS | 0% | 5% | 10% | 15% | 20% |
| PCV (%) | 27.0 ^{ab} ±1.00 | 25.7 ^{ab} ±4.50 | 29.70 ^a ±2.52 | 24.7 ^b ±0.58 | 28.0 ^{ab} ±0.0 |
| HBC(g/100ml) | 7.83 ^{ab} ±1.03 | 7.33 ^b ±0.60 | 8.70 ^a ±0.60 | 8.20 ^{ab} ±0.10 | 9.10 ^a ±0.35 |
| RBC(10 ⁶ /MM ³) | 2.17 ^{bc} ±0.60 | 2.27 ^{ab} ±0.10 | 2.20 ^{abc} ±0.10 | 2.13 ^c ±0.06 | 2.30 ^a ±0.00 |
| WBC | 5500 ^b ±100 | 5500 ^b ±150 | 8633 ^a ±185 | 6500 ^{ab} ±170 | 6866 ^{ab} ±65 |
| ALT | 9.00 ^a ±3.00 | 6.00 ^{ab} ±3.00 | 3.00 ^b ±1.00 | 3.00 ^b ±1.00 | 5.00 ^{ab} ±1.00 |
| AST | 17.7 ^a ±1.53 | 19.0 ^a ±0.00 | 11.7 ^b ±1.53 | 11.7 ^b ±1.53 | 10.0 ^b ±3.00 |
| MCHC (%) | 29.1 ±4.72 | 28.9 ±2.69 | 29.5 ±4.67 | 31.5 ±2.11 | 32.5 ±1.21 |
| MCH | 36.1 ±5.46 | 32.4 ±2.94 | 39.5 ±4.75 | 38.3 ±3.06 | 40.1 ±0.52 |
| MCV | 1.24 ^{ab} ±0.03 | 1.13 ^b ±0.20 | 1.34 ^a ±0.05 | 1.20 ^{ab} ±0.01 | 1.23 ^{ab} ±0.03 |

a, b, c, d and e are the superscript assigned to the mean values of blood parameters. Mean with similar superscript in the same column are significantly similar and Mean with different superscript are significantly different from each other P>0.05. The blood parameters examined are; PCV: Packed cell volume, HB:- Hemoglobin Concentration, RBC: Red Blood Cell, WBC: White Blood Cell, ALT: Alanine Aminotransferase, AST: Aspartate Aminotransferase, MCHC: -Mean Corpuscular Haemoglobin Concentration, MCH: - Mean Concentration Haemoglobin, MCV:Mean Corpuscular Volume. In the haematological parameters listed above, MCHC and MCH showed no significant different among their treatment mean value (P>0.05),Packed Cell volume values obtained for all the experimental birds varied significantly from each, with diet 3 having the highest value of 29.67±2.52 which was different to the value obtained from diet 1,2 and 5 with an average mean value of 27.00,25.67 and 28.00 respectively. The lowest PCV value was obtained from the bird fed on diet 4. Haemoglobin Concentration values obtained for all the experimental birds are similar with diet 3

and 5 having the highest value which are 8.70 and 9.10 respectively and significantly different to the value obtained from diet 1 and 4 while diet 2 had the lowest Hb value, Red Blood Cell values obtained for diet 5 with an average mean of 2.30±0.00 had the highest mean value and is similar to the value obtained for diet 2 and 3 while the value obtained for diet 4 was the least and significantly different to that of diet 1, White Blood Cell (WBC) value obtained in diet 3 is significantly different to the value for diet 4 and 5 with an average mean of 6500 and 6866, the WBC value obtained for diet 1 and 2 are the lowest. The AST value obtained for diet 1 and 2 are similar but different to the value obtained for diet 3, 4 and 5 also diet 1 had the highest value of ALT which is similar to that of diet 2 and 5, but not significantly different to the value obtained from diet 3 and 4. MCV value obtained for diet 3 had the highest value and significantly different to diet 1, 4 and 5 with an average mean of 1.24± 0.03, 1.20± 0.01 and 1.23± 0.03 respectively. The birds fed on diet 4 had the lowest value of 1.13± 0.20.

Table 3 Blood Chemistry Parameters of the Experimental Birds

| % Inclusion Level of Tithonia Diversifolia | | | | | |
|--|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| | 0% | 5% | 10% | 15% | 20% |
| Total Protein | 27.6 ^b ±0.50 | 25.2 ^c ±0.35 | 29.1 ^a ±0.15 | 23.7 ^d ±0.58 | 20.7 ^e ±0.58 |
| Albumin | 14.4 ^a ±0.51 | 13.5 ^b ±0.12 | 14.7 ^a ±0.31 | 13.2 ^b ±0.25 | 13.2 ^b ±0.22 |
| Albumin | 5.37 ^a ±0.47 | 4.34 ^b ±0.45 | 4.16 ^b ±0.33 | 5.20 ^a ±0.32 | 4.29 ^b ±0.10 |

From the result shown above, there is no significant difference in the albumin values obtained from the birds fed with diet 2, 4, and 5 but different from the values obtained for diet 1 and 3. The highest total protein was observed in diet 3

which differ from other diets including the control diets, the amount of cholesterol in diet 1 and 4 is higher and differ from diet 2, 3 and 5, and diet 3 had the lowest cholesterol content

Table 4 Growth Performance of the Experimental Birds

| | Diet 1 | Diet 2 | Diet 3 | Diet 4 | Diet 5 |
|--------------------------|-------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 0% | 5% | 10% | 15% | 20% |
| FI/BIRD/DAY | 98.7±2.01 | 94.1±6.85 | 99.8±1.52 | 96.8±2.69 | 98.8 ± 0.62 |
| WT G/BIRD/DAY | 90.8 ^a ±4.17 | 80.9 ^b ±3.24 | 92.9 ^a ±0.74 | 90.4 ^a ±3.66 | 86.5 ^{ab} ±1.69 |
| FC RATIO | 1.23 ^b ±0.15 | 1.43 ^a ± 0.06 | 1.33 ^{ab} ±0.06 | 1.33 ^{ab} ±0.06 | 1.36 ^{ab} ±0.06 |
| P.E RATIO | 3.70 ± 0.17 | 3.50±0.26 | 3.60± 0.17 | 3.73±0.06 | 3.53 ±0.12 |

From the table above birds fed on all the diets consumed similar level of feed, the highest weight gain of 92.92 was obtained on birds fed on diet 3 which was similar to that of diet 4 and diet 1 (control diet) while diet 2 had the lowest weight gain. Highest FCR was observed on diet 2 which was followed by diet 3,4 and 5 while diet 1 had the lowest feed conversion ratio. Diets 1, 2, 3, 4 and 5 had PER value of 3.70, 3.50, 3.60, 3.73 and 3.53 respectively, diet 2 had the lowest.

➤ Discussion

In comparison of this research work, the haematological values obtained from all the experimental birds indicate nutritional adequacy of the various diets since values did not indicate mal or under nutrition (8). The PCV, HB, MCH and MCHC values of the experimental birds falls within the range of 22- 35, 7-13, 33-47 and 26-35 respectively as given by (14). This supports the fact earlier said that *Tithonia diversifolia* compares favorably well with other plant protein sources when used at a recommended rate Reports from literature showed that blood indices are important for the nutritive component of a given ration (2,1), the highest value of white blood cell was obtained in diet 3, 4 and 5 having 8633, 6500 and 6866 which was significantly different from 1 and 2 ($p>0.05$) having 5500, this goes in line with (9) who observed gradual decrease in white blood with increasing level of wild sunflower meal in poultry diets due to the presence of sesquiterpene lactones which are feeding deterrent that were identified in the leaves of wild sunflower (16). Eating as well as moderate exercise may cause a slight increase in the numbers of white blood cells but the maximum will not exceed twice the minimum count (11), the similarity in the level of PCV, HB, MCV, MCH, and MCHC in broiler chicks further sustained the nutritional adequacy and safety of wild sunflower leaf meal when compared with the control diet, the adequacy could also be related to the ability of test ingredients to provide and maintain the essential amino acid and minerals in the diet which are necessary for the normal functioning of the blood cells producing tissues and organs, the findings is similar to the observation of (11) that used cassava leaf meal in weaner pigs diets. The haemoglobin obtained are 7.83, 7.33, 8.70, 8.20 and 9.10 (g/dl) in diet 1, 2, 3, 4, and 5 respectively which comply favorably well with the values 7.0-13.0 as reported by (14), diet 2 and 1 (control diet) had the lowest Hb concentration but still within the values recommended by (14), when the Hb level are normal, physiological activities such as transportation of gases, carbon dioxide and oxygen are properly maintained, this

suggest that the diet met the protein requirement of the animal, since Hb decreases in animal on low protein intake which leads to parasitic infection or liver damage (15) The blood variables most often affected by dietary influence were identified as Packed Cell Volume, plasma, glucose and clotting time (20) these values in the experimental birds were found to be consistently normal, on a similar note, the MCHC, MCH and HBC were in agreement with the findings of (11) From the results of the blood chemistry parameters, there is no significant difference in the albumin values between diet 2, 3 and 5 which is differ from the values obtained for diet 1 and 3, the value obtained across the five diets are 14.40, 13.45, 14.68, 13.16 and 13.22 respectively which contradicts the range (2.5-4.0 g/dl) reported by (3)

The highest total protein was observed in diet 3 which diver from other diets, this shows that material investigated (*Tithonia diversifolia*) is adequate and compares favorably with other plant protein sources, this observation corroborated by (4) who demonstrated the dependency of blood protein in the quality and quantity of dietary protein

IV. CONCLUSION

From the result obtained, it was evident that *Tithonia diversifolia* wild sunflower leaf protein concentrate even though not yet fully known to the poultry farmers can be tolerated by chicks up to 10% level of dietary protein inclusion due to the facts that Packed Cell Volume of diet 3 with 10% inclusion level of *Tithonia diversifolia* had the highest value, (20) declared that PCV is a necessary parameter to determine the quality of feed offered to farm animals. The values in the experimental birds were found to be consistently higher than most values earlier reported as comparable with the report for chick fed with soybeans in place of fishmeal (2). This study reveals that 10% inclusion level of *Tithonia diversifolia* can be recommended to the poultry farmers without any deleterious effect on the birds.

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