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# EFFECT OF *Prosopis africana (African mesquite)* OIL AS A PHYTOGENIC FEED ADDITIVE ON HAEMATOLOGY AND SERUM BIOCHEMICAL INDICES OF BROILER CHICKEN

**J. O. ALAGBE** [a*]

[a] Department of Animal Science, University of Abuja, Gwagwalada, Nigeria.

**AUTHOR'S CONTRIBUTION**

The sole author designed, analyzed, interpreted and prepared the manuscript.

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## ABSTRACT

This experiment was conducted to examine the effect of *Prosopis africana (African mesquite)* oil as a phytogenic feed additive on the haematology and serum biochemical indices of broiler chicken. GC-MS analysis of *Prosopis africana* oil (PSO) revealed the presence of 21 bioactive chemicals with therapeutic properties. A total of 540 1-day old broiler chicks (Ross 307) were randomly assigned to 6 treatments with six replicates consisting of 15 birds each in a completely randomized design. Treatment 1 (T1) (basal diet + 0% PSO), treatment 2 (basal diet + 1.5 g/kg neomycin), T3, T4, T5 and T6 were fed basal diet with PSO at 100 mg, 200 mg, 300 mg and 400 mg/kg feed respectively. The experiment lasted for 56 during which fresh water and feed were offered *ad libitum*. Vaccination was also carried out and all other management practices were strictly observed. Result from the analysis revealed that red blood cell, pack cell volume, haemoglobin concentration, mean corpuscular volume, mean corpuscular heamoglobin, mean corpuscular haemoglobin concentration, white blood cells and its differentials were significantly ($P<0.05$) different among the treatments. Feeding broilers with PSO resulted in lower values of heterophils/lymphocytes ratio ($P<0.05$). Similarly, all the serum biochemical parameters (albumin, globulin, glucose, cholesterol, ALP, AST and ALT) were significantly ($P<0.05$) influenced by the treatments; expect for creatinine, urea, triglycerides, LDL and HDL values that were not significantly ($P>0.05$) different among the treatments. It was concluded that PSO could be included up to 400 mg/kg diet of broilers without causing any negative effect on the health status of the animal.

**Keywords:** *Prosopis africana;* broilers; haematology; serum; gas chromatography; mass spectrometry.

## 1. INTRODUCTION

The use of phytogenic feed additives is constantly gaining interest globally due to risk risk pose by the indiscriminate use of antibiotics especially among livestock farmers in developing countries [1-3]. The dangers of antimicrobial resistance and residue of toxic substances in animal products (milk, egg and meat) has also led to the increasing cases of diseases and deaths [4] (Santi and Kim, 2017). Among the potential alternatives used to replace antibiotics are: organic acids, prebiotics, probiotics and most recently essential oils [5,6].

Essential oils contain several biological active chemicals (phytochemicals or secondary metabolites) with therapeutic properties required for growth of animals, suppression of pathogenic bacteria, improving palatability, scavenging free radicals, immune booster and efficient nutrient utilization [7,8]. This wide range of metabolic effect is a clear

**Corresponding author: Email: dralagbe1@finmail.com;*

indication that essential oils are capable of performing multiple biological activities (antimicrobial, antiviral, hepatoprotective, antioxidant, hypolipidemic, antifungal) [9,10]. The phytochemicals in essential oils vary according to plant species, age of plant, parts of the plants used, extraction procedure, climatic conditions and harvesting time [11,12]. Phytochemicals have also been regarded as a low molecular weight compounds with numerous pharmaceutical agents such as: alkaloids, terpenoids, tannins, flavonoids, saponins and phenolic compounds [13, 14].

Blood is regarded as a carrier of nutrients and other materials in the body (Olabanji et al., 2017). It has several constituents which may be influenced by nutrition and has been reported to be a vital tool to access the health status of an animal [15,16]. For instance, haematological and serum biochemical investigations are used to ascertain feed toxicity, nutritional status, immune response, oxidative stress as well as the health status of birds [17]. According to Etim et al. (2014); Gupta et al. [18], accessing the blood of animals is a veritable tool to examine the nutritional, physiological and pathological status of an animal. The nutritional value of any feed additive could be ascertained via: pack cell volume, red blood cell, haemoglobin, mean corpuscular volume, mean corpuscular haemoglobin concentration, white blood cell and its differentials and total protein among others [18, 19].

Previous studies have shown that supplementation of thymol oil at 200 mg/kg of feed in the diet of broilers led to an increase in immunoglobulins and lymphocyte proliferation rate, thus suppressing the activities of pathogenic bacteria and diseases [20]. The increase in pack cell volume in broiler chicks was observed with the inclusion of oregano oil at 100 mg/kg feed. All the results on different essential oils have proven that it is safe and effective without causing any negative effect on the general performance of animals. However, there is scanty information on the use of *Prosopis africana* oil as an organic alternative to antibiotics.

This experiment was designed to evaluate the effect of *Prosopis africana (African mesquite)* oil as a phytogenic feed additive on the haematology and serum biochemical indices of broiler chickens.

## 2. MATERIALS AND METHODS

### 2.1 Site of the Experiment

This experiment was carried out at the Department of Animal Science, Faculty of Agriculture, University of Abuja Teaching and Research Farm, Main Campus, along Airport Road, Gwagwalada, Abuja, Nigeria. Gwagwalada is the headquarters of the Gwagwalada Area Council; located between latitudes $8^{o}57^{1}$ and $8^{o}55^{1}$N and longitude $7^{o}05^{1}$ and $7^{o}06^{1}$E.

### 2.2 Collection and Extraction of *Prosopis africana* Oil

Fresh seeds of *Prosopis africana* samples were collected within the University of Abuja Teaching and Research Farm on August 2021. They were cleaned with a running tap water to remove dirts and taken to the Department of Crop Science, University of Abuja, Nigeria where they were identified and assigned a reference number ULH 2021 E.

The identified seeds were shade dried for 13 days to retain the bioactive chemicals in the sample after which it was grinded into a powder form using a laboratory blender (Pansonic, Model: 15GT-045F, Japan). *Prosopis africana* oil was extracted using a cold press machine (Model LYZX18). Cold press expeller is a new generation of low temperature screw oil expeller and is especially well suited for mechanical processing of seeds. It has a total power of 27.2 kW, boundary dimensions (3176 × 1850 × 2600 mm) and operates at low temperature (10 – 15 degrees). Grinded powder of *Prosopis africana* (2000g) was poured into the funnel (feeder) of the machine it then passes through the stainless valve which prevents the sample from contamination. The machine runs for 10 minutes and *Prosopis* oil (PSO) was collected via the squeeze cage (outlet) and stored in a clean well labeled container before it was sent to the laboratory for further analysis.

### 2.3 Management of Experimental Animals

The experiment lasted for 56 days and a total of 540 1-day old Ross (307) of mixed sex were purchased from a commercial hatchery in Ibadan, Oyo State, Nigeria. A battery cage measuring (length × width × height: 300 × 150 × 90 cm) equipped with concentrate drinkers and feeders was used for the experiment; distance between the base and the main cage is 35 cm, galvanized cages were disinfected two weeks before the arrival of the birds. Grasses were cleared within the surroundings' and foot bath was created to ensure strict biosecurity. On arrival, birds they were randomly divided into 6 treatments with six replicates consisting of 15 birds each in a completely randomized design. Anti-stress (Strexia wsp®) was administered at 10 g to 15 litres of water. Fresh clean water and feed were provided *ad libitum* as presented in Table 1. 200 Watt bulbs were used to provide heat to the animals and all other management practices were strictly adhered to. Daily feed intake, average daily weight gain (ADWG) and feed conversion ratio (FCR) were determined weekly.

**Table 1. Ingredient and chemical composition of the basal diets**

| Ingredients | Starters mash (0-4 weeks) | Finishers mash (5-8 weeks) |
|---|---|---|
| Maize | 52.00 | 60.00 |
| Wheat offal | 2.50 | 5.00 |
| Soya bean meal | 30.00 | 25.00 |
| Groundnut cake | 6.50 | 4.00 |
| Fish meal (72%) | 2.00 | 1.00 |
| Limestone | 2.00 | 1.50 |
| Bone meal | 4.00 | 4.00 |
| Lysine | 0.20 | 0.20 |
| Methionine | 0.20 | 0.20 |
| *Premix | 0.25 | 0.25 |
| Salt | 0.30 | 0.30 |
| Toxin binder | 0.10 | 0.10 |
| **Total** | 100.0 | 100.0 |
| **Analysis (% DM)** | | |
| Crude protein | 23.41 | 21.09 |
| Crude fibre | 4.18 | 5.01 |
| Ether extract | 4.03 | 4.47 |
| Calcium | 1.50 | 1.80 |
| Phosphorus | 0.70 | 0.96 |
| Energy (Kcal/kg) | 2900.8 | 3104.5 |

***Premix supplied per kg diet: - vit A, 13,000 I.U; vit E, 5mg; vit D3, 3000I.U, vit K, 3mg; vit B2, 5.5mg; Niacin, 25mg; vit B12, 16mg; choline chloride, 120mg; Mn, 5.2mg; Zn, 25mg; Cu, 2.6g; folic acid, 2mg; Fe, 5g; pantothenic acid, 10mg; biotin, 30.5g; antioxidant, 56mg (Starter)**

****Premix supplied per kg diet: - vit A, 9,000 I.U; vit E, 10mg; vit D3, 1500I.U, vit K, 3.8mg; vit B2, 10 mg; Niacin, 15mg; vit B12, 10mg; choline chloride, 250mg; Mn, 5.0mg; Zn, 56mg; Cu, 1.6g; folic acid, 2.8mg; Fe, 5.1g; pantothenic acid, 10mg; biotin, 30.5g; antioxidant, 56mg (finisher)**

## 2.4 Experimental Framework

Treatment 1: Basal diet plus 0% PSO

Treatment 2: Basal diet plus 1.5 g/kg diet

Treatment 3: Basal diet plus 100 mg/kg PSO

Treatment 4: Basal diet plus 200 mg/kg PSO

Treatment 5: Basal diet plus 300 mg/kg PSO

Treatment 6: Basal diet plus 400 mg/kg PSO
Measurements

## 2.4 GC-MS Analysis of *Prosopis africana* Oil (PSO)

GC-MS analysis of PSO was carried out on Varian system product model 450 GC system equipped with the following features: carrier gas is helium with a column head pressure of 10 psi and a flow rate of 500 mL/min with maximum temperature ramp rate of 120 $^{o}$C/minutes, injectors: 1079 PTV (Programmable Temperature Vaporizing) ChromatoProbe$^{TM}$. The GC column was RT-7ms, fused with a 5% methyl poly siloxane stationary phase with an internal diameter of 0.2 mm, length of 20 mm and thickness of 0.2 µm with scan range of 50 – 2000 amu.

Identifications of the compounds in *Prosopis africana* oil were based on mass spectral matching with standard compounds in National Institute of Standard and Technology (NIST).

## 2.5 Proximate Analysis of Experimental Diet

Proximate analysis of experimental diet was carried out using near infrared spectroscopy (NIR) machine consisting of a model NIRS$^{TM}$ DA1650 with a versatile scanning range of 1100 – 1650 nm, detector (256 pixel inGaAs diode array), optical bandwidth (10.44 nm) and analysis time (<1minutes).

Blood sample analysis

Blood samples were collected on the 56$^{th}$ day of the experiment via the wing vein of 12 randomly selected birds per treatment for heamatological and serum biochemical parameters. Sample bottles for heamatology contain an anticoagulant (EDTA) while those for serum analysis had no anticoagulant in them.

2 ml of blood was collected in each of the bottles and were taken to the laboratory immediately after collection in an ice pack. Heamatology was carried out using QBC STAR dry automated machine consisting of a model 429001 PN with dimension 40.6 cm × 41.4 cm × 41.4 cm (width × depth × height), sample volume (70µL) and 58 mm thermal recorder paper as printout. Heamatological parameters include: red blood cell (RBC), pack cell volume (PCV), haemoglobin (Hb), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), white blood cell (WBC) and its differentials.

Serum biochemical parameters (albumin, globulin, cholesterol, triglycerides, uric acid, creatinine, alanine serum transferase, alanine serum phosphatase were carried out using SAMPLE AUTOLOADER model XL 100 (Czech Republic) with reagent volume (120 µL – 550 µL), assay modes (1-point, 2-point, rate A and rate B), reaction temperature (37$^{o}$C) and PC-host computer (TCP/IP and RS-232C).

### 2.6 Statistical Analysis

All data were subjected to one -way analysis of variance (ANOVA) using SPSS (18.0) and significance means were separated using software of the same package. Significant was declared if $P \leq 0.05$.

## 3. RESULTS AND DISCUSSION

### 3.1 GC-MS Result of *Prosopis africana* Oil (PSO)

Essential oils (EOs) are volatile oils having phytogenic properties and it can be obtained from seeds, buds, flowers, leaves, stem bark, twigs and roots (Miguel, 2010). They are rich in various phytochemicals or secondary metabolites whose composition depends on plant species, part of plant used as well as the method of extraction used [1-3]. Essential oils play specific pharmacological functions in the body of animals such as: antifungal, antibacterial, antiviral, anti-inflammatory, antioxidants, neuroprotective, antispasmodic, immuno-modulator, hepato-protective activities (Prakash and Gupta, 2009; Sakamoto et al., 2010; Shittu and Alagbe, 2021). The most abundant bioactive compound in *Prosopis africana* oil are: methylencedioxyl flavones (25.44%), trimethyloxyflavone (20.10%) also known as prosogerin A, pentametoxyflavone (18.02%) or prosogerin B and tetramethyloxyflavone (11.58%) or prosogerin C respectively. These bioactive compounds are group of flavonoids which have been reported to known to posses antimicrobial and antioxidant properties [1,2,3] (Prakash et al., 2011). The result obtained in this experiment confirms the earlier report of Agubosi et al. [21]. Pentane,1,3-epoxy-4methyl (3.93%), patuletin (2.94%), 12-Oleanen-13,11-dione (3.93%) and sitosterol (4.70%) are group of phenolic compounds reported to have the ability to scavenge free radicals and also acts as an antibacterial [22,23](Adewale et al., 2020). All other compounds reported were below 2% however, they also have therapeutic importance in curing diseases due to the presence of secondary metabolites. For instance, prosopilosidine (0.45%) is a group of alkaloids suggested to be involved in antimicrobial and antispasmodic activities (Scalbert et al., 2005; Kris-Etherton et al., 2002).

### 3.2 Effect of *Prosopis africana* Oil on the Haematological Parameters of Broiler Chicks

Table 3 reveals the effect of *Prosopis africana* oil on the haematological parameters of broiler chicks. The values obtained ranged from: PCV (29.11 – 36.76%), Hb (9.98 – 13.78 g/dL), RBC (2.00 – 3.60 ($\times 10^{6}$/L), MCV (29.83 – 60.02 fl), MCH (30.46 – 43.79%), MCHC (20.18 – 33.97%), lymphocytes (58.22 – 73.87%), WBC (16.06 – 26.25 $10^{9}$/L), heterophil (24.80 – 27.60%), monocytes (1.00 – 2.11%), eosinophils (0.15 – 0.71%) and H:L (0.34 – 0.47%). All the parameters evaluated were significantly ($P<0.05$) influenced by the treatments. PCV, Hb, RBC, WBC, monocytes and lymphocytes values increased as the level of PSO increases across the treatment. However, all values were within the normal physiological range for healthy birds reported by Livingston et al. [24]; Talebi et al. (2007). PCV (29.11 – 36.76%) and Hb (9.98 – 13.78 g/dL) values fall within the range reported by Abdi-Hachesoo et al. [25] and Islam et al. [26,27]. Normal haematological values in this study could be attributed to adequate nutrition in the diet as well as the safety level of PSO. In contrast to MCH in this experiment the values obtained (30.00 – 43.79 pg) was lower than 45.00 - 56.10 pg reported by Alagbe [1-3] when *Castella asiatica* leaf was fed to broiler chicks as an alternative to antibiotics. Abnormal levels in the in heamatological parameters may indicate anaemia, liver damage, poor nutrition as well as infestation by parasites [28]. High WBC levels recorded in T3-T6 could trigger the defensive mechanism to be alert and sensitive to any infection or disease [29,17]. Feeding birds with PSO also resulted in lower value of heterophil/lymphocyte ratio among animals in T4-T6 which is a clear indication of stress reduction due to the medicinal properties of the test material [30-32]. Eosinophils have been reported to play a crucial role in preventing endo and ectoparasites as well as regulating allergic processes in animals [33,34].

**Table 2. GC-MS result of *Prosopis africana* oil (PSO)**

| | Compounds | Peak area (%) | Retention time |
|---|---|---|---|
| 1 | Methylencedioxyl flavones | 25.44 | 5.33 |
| 2 | Pentametoxyflavone | 18.02 | 3.10 |
| 3 | Trimethyloxyflavone | 20.10 | 1.73 |
| 4 | Tetramethyloxyflavone | 11.58 | 5.70 |
| 5 | Patuletin | 2.49 | 11.21 |
| 6 | Quercertin | 0.11 | 9.60 |
| 7 | Luteolin | 1.50 | 9.12 |
| 8 | Kaemperol | 0.67 | 7.37 |
| 10 | 3-nitropropanoic acid | 0.77 | 2.50 |
| 11 | Isovitexin | 1.35 | 4.57 |
| 12 | Cis-(6αβ, 12αβ)-hydroxyrotenone | 1.75 | 4.08 |
| 13 | 12-Oleanen-13,11-dione | 2.04 | 11.39 |
| 14 | Methyl 11-octadecenoate | 1.71 | 9.06 |
| 15 | Prosopilosidine | 0.45 | 9.50 |
| 16 | Pentane,1,3-epoxy-4methyl | 3.93 | 9.02 |
| 17 | Ellagic acid | 0.16 | 10.55 |
| 18 | Sitosterol | 4.70 | 10.15 |
| 19 | Hexadecanoic acid | 2.23 | 8.80 |
| 20 | Prosoflorine | 0.01 | 2.61 |
| 21 | Tryptamine | 0.02 | 1.77 |

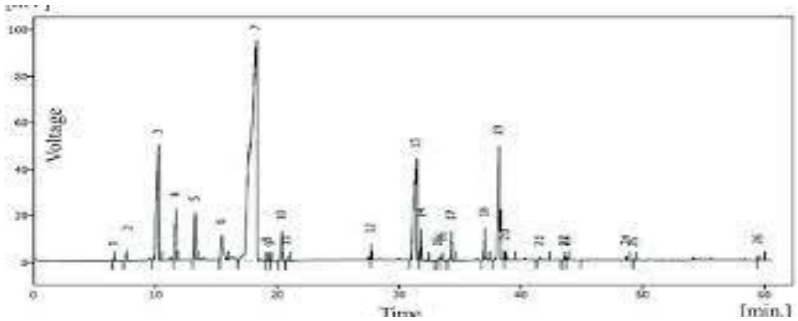


**Fig. 1. GC-MS chromatograph of PSO**

**Table 3. Effect of *Prosopis africana* oil on the haematological parameters of broiler chicks**

| Parameters | T1 | T2 | T3 | T4 | T5 | T6 | SEM |
|---|---|---|---|---|---|---|---|
| PCV (%) | $29.11^{b}$ | $29.87^{b}$ | $34.56^{a}$ | $35.06^{a}$ | $36.10^{a}$ | $36.76^{a}$ | 2.21 |
| Hb (g/dL) | $9.98^{c}$ | $10.09^{b}$ | $13.32^{a}$ | $13.00^{a}$ | $13.40^{a}$ | $13.78^{a}$ | 0.31 |
| RBC($\times10^{12}$/L) | $2.00^{c}$ | $3.01^{ab}$ | $3.16^{a}$ | $3.32^{a}$ | $3.59^{a}$ | $3.60^{a}$ | 0.17 |
| MCV (fl) | 29.83 | 30.22 | 38.77 | 44.95 | 56.88 | 60.02 | 1.63 |
| MCH (pg) | $30.46^{b}$ | $32.00^{b}$ | $38.40^{b}$ | $42.65^{a}$ | $42.75^{a}$ | $43.79^{a}$ | 1.22 |
| MCHC (%) | $20.18^{b}$ | $26.18^{b}$ | $32.00^{a}$ | $33.50^{a}$ | $33.83^{a}$ | $33.97^{a}$ | 1.05 |
| WBC($\times10^{9}$/L) | $16.06^{b}$ | $20.07^{a}$ | $21.44^{a}$ | $23.06^{a}$ | $23.87^{a}$ | $26.52^{a}$ | 0.96 |
| LYM (%) | $58.22^{c}$ | $66.08^{b}$ | $67.10^{b}$ | $68.40^{b}$ | $71.30^{a}$ | $73.87^{a}$ | 0.76 |
| HET (%) | 27.60 | 24.90 | 25.85 | 24.91 | 24.88 | 24.80 | 1.31 |
| MON (%) | $1.00^{b}$ | $1.24^{b}$ | $1.63^{b}$ | $2.00^{a}$ | $2.09^{a}$ | $2.11^{a}$ | 0.19 |
| EOS (%) | 0.15 | 0.40 | 0.56 | 0.61 | 0.65 | 0.71 | 0.16 |
| H/L | $0.47^{a}$ | $0.38^{b}$ | $0.39^{b}$ | $0.36^{b}$ | $0.35^{b}$ | $0.34^{b}$ | 0.02 |

*Means within rows with different letters are significantly different ($p<0.05$); PCV: pack cell volume; Hb: haemoglobin; RBC: red blood cell; WBC: white blood cell; MCV: mean corpusculaer volume; MCH: mean corpuscular haemoglobin; MCHC: mean corpuscular haemoglobin concentration; LYM: lymphocytes; MON: monocytes; BAS: basophils; HET: heterophils; EOS: eosinophils; SEM: standard error of mean; T1: basal diet + 0% Prosopis africana oil; T2: basal diet + 1.5g/kg neomycin; T3: basal diet + 100 mg PSO; T4: basal diet + 200 mg PSO; T5: basal diet + 300 mg PSO; T6: basal diet + 400 mg PSO*

**Table 4. Effect of *Prosopis africana* oil on the serum biochemical indices of broiler chicks**

| Parameters | T1 | T2 | T3 | T4 | T5 | T6 | SEM |
|---|---|---|---|---|---|---|---|
| T.P (g/dL) | 3.88$^{c}$ | 4.31$^{b}$ | 6.60$^{a}$ | 6.91$^{a}$ | 6.95$^{a}$ | 7.02$^{a}$ | 0.17 |
| ALB (g/dL) | 1.66$^{b}$ | 1.87$^{b}$ | 3.00$^{a}$ | 3.18$^{a}$ | 3.28$^{a}$ | 3.40$^{a}$ | 0.19 |
| α-GLO (g/dL) | 1.00$^{b}$ | 1.23$^{b}$ | 1.68$^{b}$ | 1.89$^{b}$ | 2.00$^{a}$ | 2.03$^{a}$ | 0.12 |
| β-GLO (g/dL) | 1.97$^{b}$ | 2.02$^{a}$ | 2.08$^{a}$ | 2.13$^{a}$ | 2.40$^{a}$ | 2.56$^{a}$ | 0.25 |
| GLO (g/dL) | 2.22$^{b}$ | 2.44$^{b}$ | 3.00$^{a}$ | 3.73$^{a}$ | 3.67$^{a}$ | 3.60$^{a}$ | 0.37 |
| GLU (mg/dL) | 240.9$^{a}$ | 233.6$^{a}$ | 200.8$^{ab}$ | 191.2$^{b}$ | 190.4$^{b}$ | 150.2$^{c}$ | 2.75 |
| CHO (mg/dL) | 187.4$^{a}$ | 173.1$^{a}$ | 140.3$^{bc}$ | 118.4$^{c}$ | 109.3$^{c}$ | 104.6$^{c}$ | 1.45 |
| Urea (mg/dL) | 6.36 | 6.00 | 6.27 | 6.16 | 6.44 | 6.09 | 0.17 |
| CRT (mg/dL) | 0.75 | 0.77 | 0.63 | 0.66 | 0.62 | 0.65 | 0.01 |
| HDL (U/L) | 42.88 | 42.10 | 45.29 | 48.10 | 47.39 | 51.04 | 1.71 |
| LDL (U/L) | 21.40 | 20.02 | 19.05 | 19.60 | 18.03 | 18.40 | 0.51 |
| TRY (mg/dL) | 78.34 | 70.09 | 68.83 | 65.60 | 65.00 | 64.42 | 0.95 |
| ALP (U/L) | 310.2$^{a}$ | 287.4$^{b}$ | 255.0$^{b}$ | 234.1$^{b}$ | 220.7$^{b}$ | 219.5$^{b}$ | 1.90 |
| AST (U/L) | 64.23$^{a}$ | 59.84$^{ab}$ | 50.87$^{ab}$ | 43.88$^{b}$ | 41.90$^{b}$ | 38.09$^{c}$ | 1.07 |
| ALT (U/L) | 24.09$^{a}$ | 20.80$^{a}$ | 18.40$^{b}$ | 18.03$^{b}$ | 16.54$^{b}$ | 15.00$^{c}$ | 0.83 |

*Means within rows with different letters are significantly different (p<0.05); TP: total protein; ALB: albumin; GLO: globulin; GLU: glucose; CHO: cholesterol; TB: total bilirubin; CRT: creatinine; HDL: high density lipoprotein; LDL: low desnsity lipoprotein; TRY: triglycerides; alanine phosphatase; alanine serum transaminase; alanine transferase; SEM: standard error of mean; T1: basal diet + 0% Prosopis africana oil; T2: basal diet + 1.5g/kg neomycin; T3: basal diet + 100 mg PSO; T4: basal diet + 200 mg PSO; T5: basal diet + 300 mg PSO; T6: basal diet + 400 mg PSO.*

### 3.3 Effect of *Prosopis africana* Oil on the Serum Biochemical Indices of Broiler Chicks

Effect of *Prosopis africana* oil on the serum biochemical indices of broiler chicks is presented in Table 4. Total protein values, albumin, globulin, α-globulin, β-globulin, glucose, cholesterol, urea, creatinine, high density lipoprotein, low density lipoprotein and triglycerides ranged from 3.88 – 7.02 g/dL, 1.66 – 3.40 g/dL, 2.22 – 3.60 g/dL, 1.00 – 2.03 g/dL, 1.97 – 2.56 g/dL, 150.2 – 240.9 mg/dL, 104.6 – 187.4 mg/dL, 6.00 – 6.44 mg/dL, 0.62 – 0.75 mg/dL, 42.10 – 51.04 U/L, 18.03 – 20.02 U/L and 64.42 – 78.34 mg/dL respectively. Total protein, albumin, globulin, α-globulin, β-globulin, glucose and cholesterol values were significantly ($P<0.05$) different among the treatments. Albumin and globulin levels are good indicators of dietary protein quality (Gauche et al., 1991). However, it was observed that birds in T3 – T6 had the highest value of total protein, intermediate in T2 and lowest in T1. According to Mitruka and Rawnsley (1997), a lower serum protein value could be as a result of infection, low immune system as well as starvation. Lower cholesterol levels recorded among birds fed PSO shows that the test material can perform a hypolipidemic function, thus reducing the risk of cardiovascular disease and improving the shelf life of meat [35,36]. Glucose levels are influenced by stress, age of animal as well as method of blood collection [37]. However, the range of glucose level obtained in this experiment confirms the earlier report of Jang et al. [38]; Basmacioglu et al. [39,40]. Urea, creatinine, high density lipoprotein, low density lipoprotein and triglycerides levels were not significantly ($P>0.05$) different among the treatments. Urea and creatinine levels reported in the study, did not adversely affect the function of the liver and kidney, thus leading to the death of birds [41,42]. Similar, a decrease in LDL, triglycerides and HDL levels across the treatment could be as a result of a decrease in cholesterol absorption in the intestine due to the modulatory activity of PSO [21,43]. Alanine transaminase (AST), alanine phosphatase (ALP), alanine serum transferase (ALT) values ranged from 38.09 – 64.23 (U/L), 219.5 – 310.2 (U/L) and 15.00 – 24.09 (U/L) respectively. All the values were significantly ($P<0.05$) influenced by the treatment. ALP, ALT and AST values were higher in T1 compared to the other treatments ($P<0.05$). Elevated values in these enzymes could imply a disorder in the liver or presence of toxic substance in the blood [44,45].

## 4. CONCLUSION

It was concluded the PSO is a reservoir of several phytochemicals with therapeutic importance and could be used to bridge the gap between food safety and livestock production. Several bioactive components were observed from the GC-MS analysis of the oil. The inclusion of PSO up to 400 mg/kg feed had no deleterious effect on the haematological and serum biochemical indices of broiler chicks.

## ETHICAL APPROVAL

The experiment was done according to the guidelines of animal protocol approved by the research committee of the Department of Animal Science, University of Abuja, Nigeria with reference number 19/501ANSJ/004.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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