ISSN:
Print - 2277 - 0755
Online - 2315 - 7453

Journal of Agricultural Science and Environment

EFFECTS OF BUSH MARIGOLD (*Aspilia africana*) LEAF EXTRACT ON THE PERFORMANCE AND BLOOD BIOCHEMISTRY PARAMETERS OF BROILER CHICKENS

W. U. OSIAGOR AND C. NWANKWO

Department of Agricultural Education Federal College of Education (Tech.) Omoku Rivers State.
*__Corresponding Author__:osiagorwisdom@gmail.com **Tel**: +234

ABSTRACT

The effects of *Aspilia africana* (bush marigold) leaf extract on the performance and blood biochemistry of broiler chickens were evaluated in a feeding trial for 56 days. A total of One hundred and twenty (120) mixed sexed day-old broiler chicks of the breed Cuphon were randomly grouped into four treatments, with three replicates of ten birds each in a completely randomized design (CRD) at 4 weeks of age after brooding. The *Aspilia africana* leaves were harvested fresh from the premises of the Teaching and Research Farm, School of Secondary Education, Federal College of Education (Technical) Omoku Rivers State. For each treated group, the appropriate quantity of 3g, 4g and 5g of leaves were weighed accordingly, chopped into small sizes and blended. The blended samples were thereafter added to 5 litres of water each and sieved with a fine sieve. The sieved extracts were then served to the birds as their drinking water per treatment group on a daily basis for the experimental period. T1 served as the control (without *Aspilia africana* in their drinking water of 5 litres), T2 received 3g /5 litres of water, T3 received 4g/5 litres of water and T4 received 5g/5 litres of water. Growth parameters, feed intake, water intake, body weight gain and feed conversion ratio were evaluated. At the end of the experimental period, three (3) birds per treatment (one bird per replicate) were randomly selected and bled by severing the jugular vein. The blood samples were collected in a labeled lithium heparin bottle and were analyzed for total cholesterol (TC), triglyceride (TG), high density lipoprotein (HDL), aspartate aminotransferase (AST), alkaline phosphate (ALP), total protein (TP), total bilirubin (ALB) and conjugated bilirubin (CB). Data collected were analyzed by one way analysis of variance (ANOVA) for complete randomized designs; differences between means were separated by Duncan Multiple Range Test (DMRT). There were significant differences ($p<0.05$) in the body weight gain, daily feed intake, daily water intake and feed conversion ratio. Birds in T2 (3g /5 litres) recorded the best result for feed conversion ratio (2.59±0.01), feed intake (126.72±0.11) and weight gain (48.99±0.03); followed by T3(4g/ 5 litres) and T4 (5g/ 5 litres). The blood biochemistry analysis revealed that there were significant differences ($p<0.05$) in TC, TG, HDL, AST, ALT and ALP while TP, TB and CB showed numerical differences. It was observed that TC and HDL increased with increased *Aspilia africana* in the water served among the treated birds while TG, ALT and ALP decreased. However, birds on low level of *Aspilia africana* in T2 (3g/5 litres) gave a better result in all the blood biochemistry attributes evaluated among the treated groups. The result from this study revealed that 3g of *Aspilia africana* leaf extract in 5 litres of water can be recommended for broiler production, since it promotes growth with better blood biochemistry result compared to other treated groups in this study.

INTRODUCTION

The use of medicinal plants for treatment of various infections in traditional communities has been an age-long global practice. It has been estimated that 80% of African population use herbal regimen for treatment and control of diseases (Hugo and Russell, 2003). This provides a rationalization for studying medicinal plant extracts as a possible source of alternative therapy against infections. Apart from the expensive costs of some antibiotics, most of the clinically- important antibiotics have major setbacks.

A good number of conventional antibiotics have been found to be neurotoxic, nephrotoxic, and hypertensive, and few others cause severe damage to the liver and bone marrow depression (Chong and Pagano, 1997). The primary benefit of using herbal drugs is that they are relatively safer and cheaper than the synthetic alternatives (Aiyegoro and Okoh, 2009). In addition, herbal medicine is a complex mixture of different phytochemicals acting by different mechanisms, which makes it difficult for pathogens to develop resistance (Daferera *et al.,* 2003).

Aspilia africana is widely used in ethnomedicinal practices in West tropical and East Africa as a general healing agent, pain killer, sedative, echolic, lactation stimulant and most importantly as a haemostatic agent because of its ability to stop bleeding even from a severed artery, as well as bee and scorpion stings (Single, 1965). The plant is used to treat different diseases in different ecological zones, due to varying chemical composition as a result of various ecological conditions of different places. In Kenya, they are used to kill intestinal worms. In Uganda, it is used to treat gonorrhea (Page *et al*., 1992). The crushed leaves and flowers are used to stop bleeding and for treating wounds and sores.

In Tangayika, a root decoction is taken for tuberculosis. The methanol extract of the leaves are reported to cure malaria and respiratory problems (Musyimi *et al.,* 2007). The effect of *A. africana* leaves on reproduction is not well documented. However, unauthenticated information in some communities in Nigeria has it that it prevents conception when boiled; alleviates menstrual cramps and dysmenorrheal.

A comparative phytochemical analysis of the leaves of *A. africana* reveals the presence of alkaloids, saponins, tannis, flavonoids, resins, sterols, terpenoids and carbohydrate (Obadoni and Ochuko, 2002). The phytochemical screening of the plant extracts reveals the presence of high concentration of bioactive compounds including tannin, terpenoids, alkaloids and others. These phytochemicals have been proven to possess biocidal and inhibitory activities against a wide range of microorganisms (Cowan, 1999; Iwu *et al*., 1999; Aiyegoro and Okoh, 2009). It has also been established that the age of the plant when harvested and the season in which the plant is harvested affects the amount of the bioactive ingredients of the plant as these active ingredients vary in quality and quantity from season to season (Sofowora, 1982).

The effects of aqueous extract of *Aspilia africana* on the reproductive function of female wistar rats have been reported. Results showed that aqueous extract of *A. africana* has anti-fertility effects by altering oestrous cycle and causing a dose dependent adverse effects on ovulation in Wester strain rats (Oyesola *et al.,* 2010). The leaf extract has also been proven to possess extracellular Ca2+ dependent which increases the vascu-

lar tone and measure the vaso-constriction. This mechanism suggests the possibility of the leaf extract to arrest bleeding from fresh wounds (Okoli *et al.,* 2007).

Aspilia africana is a tropical shrub widely distributed across tropical Africa. In Nigeria, it is commonly known as Yurinyun by the Yorubas, Orangila by Igbos, Tozalin by Hausas and Edemedong by Efiks, Ogidigidi by the Ijaws and Ehiaewu by the Ogbas (Iwu, 1993). *Aspilia africana* is of high economic and medicinal importance due to its active roles in wound healing, treatment of rheumatic pains, etc.

The plant *Aspilia africana,* among other weeds are reported to be a source of protein, although the quantity is not sufficient for both human and livestock demands (Umoh and Oke, 1974). However there still remain a large number of plants remedies used traditionally but not scientifically proven safe in relation to animal health.

It has been used as feed constituents. Since most drugs /medications are taken orally, it becomes relevant to determine the oral administration of this browse plant as they are commonly available and used by livestock farmers as forage for their animals. This study was therefore conceived to investigate the effects of oral administration of *Aspilia africana* leaf extract on the growth performance and blood biochemistry of broiler chickens.

MATERIALS AND METHODS

Experimental Sites

The experiment was conducted at the Poultry Unit of the Teaching and Research Farm, School of Secondary Education, Federal College of Education (Technical), Omoku Rivers State, located at about latitude 5º N and longitude 6.5º E in the tropics with an average temperature of about 26º C to 30ºC.

Experimental Birds and Management

A total of One hundred and twenty (120) mixed sexed day-old broiler chicks of the breed: Cuphon were procured from a commercial hatchery, Ibadan Oyo State, Nigeria. The chicks arrived at the Teaching and Research Farm, School of Secondary Education, Federal College of Education (Technical) Omoku Rivers State in a healthy condition. On arrival, the chicks were deboxed, counted and weighed to ascertain their initial weight and were administered anti-stress through their drinking water in order to relieve them of stress as a result of long distance transportation The birds were housed in a deep litter with wood shavings as bedding material and were brooded for the period of three weeks. All necessary routine vaccinations were strictly adhered. The proprietary feed used in this study at both the starter and finisher phases were of the brand name 'Top feed' with protein contents of 22% for starter and 18% for finisher which contained 2800ME/Kcal/kg and 2900ME/kcal/, respectively. Water and feed were given to the birds at *ad libitum* all through the experimental period.

Processing of Aspilia africana Leaf Extract

The leaves of the plant (*Aspilia africana*) at four months were harvested fresh from the premises of the Teaching and Research Farm, School of Secondary Education, Federal College of Education (Technical) Omoku Rivers State. For each treated group, the appropriate quantity of 3g, 4g, and 5g of leaves were weighed accordingly, chopped into small sizes and blended. The blended

samples were then added to 5 litres of water each and sieved with a fine sieve. The sieved extracts were administered to the birds as their drinking water per treatment group on a daily basis. The three treated groups were administered the leaf extract with each treatment replicated 3 times and there were 10 birds per replicate.

Experimental Design and Duration of Experiment

At the end of the brooding period, the chicks were randomly distributed into 4 treatment groups using a completely randomized design (CRD). Each treatment had 3 replicates and a total of 30 birds were placed in each treatment and assigned experimental treatment.

Different levels of *Aspilia africana* leaf extract were administered orally to the birds which served as experimental treatment. The levels of inclusion of *Aspilia africana* leaf extract per 5 litres of water in the different treatment are as follows: 0g/5L, 3g/5L, 4g/5L and 5g/5L for treatment 1, treatment 2, treatment 3 and treatment 4 respectively. Birds in control (T1) were given water without *Aspilia africana* leaf extract while birds in T2, T3 and T4 received water containing 3g, 4g and 5g of *Aspilia africana* leaf extract per 5 litre of water respectively. The experiment lasted for eight (8) weeks, after 3 weeks of pre-experimental period (brooding).

Data Collection and Analysis

Phytochemical screening of *Aspilia africana* leaf extract was carried out in the laboratory using the recommended procedure by the Association of Official Analytical Chemists (A.O.A.C 1990) for saponin, alkaloid, flavonoid, tannin, anthraquinones and cardiac glycoside. The phytochemicals were assayed using standard methods. Saponin was determined by the method described by Peng *et al*., (1995). Alkoliod was determined by the method described by Maxwell *et al.,* (1995), flavanoid was analyzed using Boham and Kocipai-Abyyazum, (1974) method, while tannins, anthraquinones and cardiac glycoside were determined spectrophotometrically.

Primary elements such as sodium, calcium, potassium, phosphorus, magnesium, zinc and iron were determined according to the method of Shahidi *et al.,* (1999).

Data on daily feed and water intake were collected per each replicate by subtracting the quantity of feed and water given from the left over for the period of the 8 weeks while body weight gain was determined on weekly basis.

At the end of the experimental period, three (3) birds per treatment (one bird per replicate) were randomly selected and bled by severing the jugular vein. The blood samples were collected in a labeled lithium heparin bottle for blood chemistry evaluation. The bottles were immediately capped and the content mixed gently for about one minute by repeated inversion. The blood samples were analyzed for total cholesterol (TC), triglyceride (TG), high density lipoprotein (HDL), aspartate aminotransferase (AST), alkaline phosphate (ALP), total protein (TP), total bilirubin (ALB) and conjugated bilirubin (CB). Serum biochemical indices were evaluated by the method outlined by Dacie and Lewis, (1994) and Hawk *et al.,* (1954).

Statistical Analysis

Data obtained were subjected to one way analysis of variance (ANOVA), using the statistical programmed (IBM SPSS version

22.0), differences between means were separated by Duncan multiple range test (DMRT) at 5% level as outlined by Duncan, (1995).

Statistical Model.

$Y_{ij} = \mu + G_i + E_{ij}$
Y_{ij} = the individual observation (j^{th}) belonging to the i^{th} treatment group;
μ = the population mean common to all treatments and observations.
G_i = effect of i^{th} treatment group (i = 1, 2, 3, 4).
E_{ij} = Error term

RESULTS

The phytochemical components and elements analysis of *Aspillia africana* leaf showed the presence of saponin, tannins, flavonoids, and cardiac glycoside, while alkaloids and anthraquinones were absent (Table 1). It was also observed that the leaf was rich in calcium, with appreciable amount of sodium, magnesium, potassium, phosphorus and zinc, while iron was present in low quantity. (Table 1).

Table 1: Phytochemical of *Aspillia africana* leaf

Constituent	Status
Alkaloids	0.00
Saponins	3.34
Tannins	2.54
Flavonoids	2.13
Anthraquinones	0.00
Cardiac glycosides	2.92
Elements	Mg/Kg
Calcium	246.05
Sodium	66.26
Magnesium	86.12
Potassium	55.75
Phosphorus	24.52
Zinc	36.05
Iron	2.35

The performance indices measured were initial body weight, final body weight, weight gain, feed intake, feed conversion ratio and water intake. Significant differences due to treatment effects existed in all the parameters evaluated except in initial and final body weight. (Table 2). With regards to body weight gain, birds administered 3g of *Aspillia africana* leaf extract per 5 litres of water had the highest weight gain (2743.47±0.03g) although it did not differ when compared with birds administered 4g. Birds administered 5g of *Aspillia africana* leaf extract per 5 litres of water recorded the highest feed intake (133.92±0.00g) while birds on 3g had the least feed intake (126.72±0.11g). Feed conversion ratio were 2.87, 2.59, 2.68 and 2.84 for birds administered 0g, 3g, 4g and 5g respectively of *Aspillia africana* leaf extract per 5 litrs of water. Feed conversion ratio was best with 3g of *Aspillia africana* leaf extract per 5 litres of water because the birds consumed less feed to produce 48.99g of meat. It was also observed that birds in the control group (0g *Aspilia africana* extract) consumed more water (0.46±0.06L) as compared to the rest of the treatments. This was followed by birds administered with 3g of *Aspilia africana* extract (0.45±0.04L), 4g of *Aspilia africana* extract (0.43±0.03L), while birds on 5g *Aspilia africana* extract (0.39±0.20L) recorded the least water intake(Table2).

Table 2: Growth Performance Contents of Broiler Birds Administered *Aspillia africana* leaf Extract

Parameters	Control Mean ± SE	3g Mean ± SE	4g Mean ± SE	5g Mean ± SE
Initial body weight (g)	60.85±0.00	60.74±0.00	60.87±0.01	60.96±0.01
Final body weight(g)	2613.39±0.03	2804.21±0.04	2777.52±0.05	2692.13±0.01
Body weight gain(g)	2552.54±0.02^{c}	2743.47±0.03^{a}	2716.65±0.03^{a}	2631.17±0.01^{b}
Av. weight gain(g)	45.58±0.01^{c}	48.99±0.03^{a}	48.51±0.03^{a}	46.99±0.01^{b}
Av. Daily feed intake(g)	130.92±0.00^{ab}	126.72±0.11^{b}	130.19±0.01^{ab}	133.92±0.00^{a}
Feed conversion ratio	2.87±0.01^{a}	2.59±0.01^{c}	2.68±0.05^{b}	2.84±0.04^{a}
Av. Daily water intake(L)	0.46±0.06^{a}	0.45±0.04^{b}	0.43±0.03^{c}	0.39±0.20^{d}

Means with different superscripts in each row are significantly different (P<0.05).

Results from blood chemistry parameters showed that significant differences existed in the measured TC, TG, HDL, AST, ALT, ALP, TB and CB. Data on TC and HDL followed a definite trend and it showed that the highest values were recorded in treatment administered 5g of *Aspilia africana* leaf extract with the value of 6.63± 042 mmol and 3.20 ±0.05 mmol while the lowest values were recorded with birds from the control group (without *Aspilia africana* extract) with the value of 3.13 ±0.24 mmol and 1.23 ± 0.08 mmol, respectively. Results on TG showed a significant decrease with an increased *Aspilia africana* leaf extract administration among the treatment groups. The highest value of 1.60±0.11 mmol in TG was observed in the control group (without *Aspilia africana* leaf extract), followed by bird administered 3g (1.20±0.05 mmol), 4g

(0.80±0.05 mmol) and 5g (0.50±0.00 mmol) of *Aspilia Africana* leaf extract. The values of HDL increased significantly with increased inclusion of *Aspilia africana* leaf extract among the treatments, the values obtained were 1.23±0.08 mmol, 1.93±0.08 mmol, 2.80±0.05 mmol and 3.20±0.05 mmol for 0g/5L, 3g/5L, 4g/5L and 5g/5L respectively. Higher values (183.00±5.77 IU/L and 163±3.05 IU/L) in AST were observed in birds administered 4g and 5g, respectively of *Aspilia africana* leaf extract while low dosage of 3g (116.33±6.33 IU/L) were significantly higher with those in the control group (131.00±6.08 IU/L). AST, decreased with the administration of *Aspilia africana* leaf extract with the highest value of 8.00±0.00 IU/L recorded from the control group while the lowest value of 4.00±0.00 IU/L were observed among the treated groups. There was a linear decrease in ALP, with increased administration of *Aspilia africana* leaf extract in the study as lower values of 321.00±2.64 IU/L and 314.00±2.08 IU/L was recorded for 4g and 5g, respectively compared with those on 0g and 3g. Although there were no significant changes in TP, TB and CB however, numerical changes were observed.

Table 3: Blood chemistry of broiler birds administered with different levels of *Aspilia africana* leaf extract

Parameters	Control Mean ± SE	3g Mean ± SE	4g Mean ± SE	5g Mean ± SE
Total Cholesterol (TC) mmol/L	3.13±0.24^{c}	4.00±0.05^{b}	4.60±0.05^{b}	6.63±0.42^{a}
Triglyceride (TG) mmol/L	1.60±0.11^{a}	1.20±0.05^{b}	0.80±0.05^{c}	0.50±0.00^{d}
High Density Lipoprotein (HDL) mmol/L	1.23±0.08^{d}	1.93±0.08^{c}	2.80±0.05^{b}	3.20±0.05^{a}
Aspartate Aminotransferase (AST) iu/L	131.00±6.08^{c}	116.33±6.33^{c}	183.00±5.77^{a}	163±3.05^{b}
Alanine Transaminase (ALT) iu/L	8.00±0.00^{a}	4.00±0.00^{b}	4.00±0.00^{b}	4.00±0.00^{b}
Alkaline Phosphate (ALP) iu/L	332.33±1.45^{a}	329.33±2.90^{a}	321.00±2.64^{b}	314.00±2.08^{b}
Total Protein (TP) g/L	56.33±9.40	49.00±3.78	39.33±4.63	46.00±0.57
Total Bilirubin (TB) g/L	20.00±2.08	18.33±3.28	25.00±0.57	25.66±2.60
Conjugated Bilirubin (CB) mmol/l	2.73±0.49	2.06±0.03	3.23±0.14	2.26±0.08

Means with different superscripts in each row are significantly different (P<0.05)

DISCUSSION

Serum biochemical parameters are important tool in livestock management (Asadi *et al*., 2006). They aid to monitor metabolic profile values which indicate whether or not haemostatic mechanisms can maintain blood composition in physiological limits under different conditions in animal husbandry (Prodanovic *et al.,* 2012). This in turn provides details on the health, disease and nutritional status of the animal (Lepitzki and Woolf, 1991; Barnes *et al.,* 2008; Stevanovic *et al.,* 2015). Investigation of blood chemistry parameters represents a useful process in the diagnosis of many diseases as well as investigation of the extent of damage of the blood (Onyeyili *et al.,* 1991). This is relevant since blood constituents' change in relation to the physiological conditions of the animals. Blood chemistry studies are important because blood is the major transport system of the body, and evaluation of the blood profile usually furnishes vital information on the body's response to injury of all forms including toxic injury (Schalm *et al.,* 1975 and Ihedioha *et al*., 2004).

Results on blood chemistry showed that total cholesterol and high-density lipoprotein value in birds served *Aspilia africana* leaf extract at 5g/5liters of water recorded a consistently increasing high value, with the highest TC value of 6.63±0.42 mmol/L and HDL value of 3.20±0.05 mmol/L. The function of total cholesterol is essential to life; it is a primary component of the membrane that surrounds each cell and it is the starting material or an intermediate compound from which the body synthesizes bile acids, steroid hormones and vitamin D. Although, higher values of cholesterol depicts hyperlipidemia, indicating that birds served 5g of *Aspilia africana* leaf extract may likely to have had heart disease. A similar finding was reported by Sturkie *et al.,* (1970). Nworgu *et al.,* (2007 also reported that birds served 120ml of fluted pumpkin leaves extract/liter had the highest value of cholesterol.

Among the treatment groups, TC, HDL and TB values that were highest in birds administered 5g of *Aspilia africana* leaf extract may be as a result of nutritional and chemical components contained in *Aspilia africana* leaf, enabling it to be used as both sedative and haemostatic agent (Single, 1965). Increase in HDL level in the body does not protect the body anymore and can also be harmful because it can lead to heart disease among the treated birds. Triglycerides are the major storage form of lipids and a major energy source. They are synthesized in the intestinal mucosa and liver from the components of fat digestion and absorption. Triglycerides values have been insufficiently evaluated in birds and may vary based on climate, hormone influence, diet and gender. Increase may occur during starvation, particularly in obese birds. Estrogen injections have been shown to elevate triglyceride concentrations in some species (Gylstorffi *et al*., 1987). The finding of the present report agrees with the assertion.

Transaminases are the most commonly used indicators of cellular necrosis, and high levels in serum may indicate liver malfunctioning (Rosenthal, 1977). They occupy a central position in amino acid metabolism; increase in the activities of the serum could have a consequential effect on the amino acid metabolism in the tissues. It may also indicate some sort of injury to the organs. Such damage may cause the enzymes to leak from the injured organs to the blood stream (Oloyede *et al.,* 2007). ALT and AST belong to a group

of enzymes that catalyze inter-conversion of amino acid and oxoacids by the transfer of amino groups. They are present in most tissues, liver, heart, skeletal muscles, brains and kidney. A decrease in ALT and AST may lead to cell damage, mainly liver or muscle disease and vitamin E/selenium deficiencies (Tietz, 1986). In this study, the bird administered 4g and 5g of *Aspilia africana* leaf extract per 5 litres of water showed significant increase in aspartate transaminase activities when compared to those administered 3g and 0g of *Aspilia africana* leaf extract per 5 litres of water. Aspartate transaminases are associated with the mitochondria and cytoplasm. Alteration in its activity could imply alteration in the cytosolic content. The mitochondrion is regarded as the engine house of the cell and exposure of this organelle to assault of any form could imply cell death. The activities of AST were observed to be lower in birds administered 3g of *Aspilia africana* leaf compared to other treated groups (4g and 5g) and also significantly higher with birds in the control group (0g). Alanine amino transaminase and alkaline phosphate reduces with increased inclusion of *Aspilia africana* leaf extract compared with the control in the presented study. However, the results obtained in this study still fell within the normal range in birds as reported by Peter, (2012). Reduction in ALT and ALP in the present study is in consonant with the previous work of Masegi *et al.,* (1993). The authors documented that lower ALT and ALP lower the cases of myocardial infarction in broiler birds.

Changes in total protein must be interpreted with respect to physiologic influences disassociated with disease. Age and stage of development will influence the concentration of total protein in birds. A decrease in total protein will lead to crushing injuries, bone fractures and extensive surgery (Kaneko, 1989). Total protein in the bird administered *Aspilia africana* leaf extract decreased among the treated birds compared to bird in the control group; this could be as a result of high intake of phyotochemicals present in the leave like flavonoids, saponins and tannins. Lower serum protein may be as a result of malnutrition, parasitism or liver disease while high values may be caused by dehydration, infection or hemolisis (Kaneko, 1989). Hormones can also have either an anabolic or catabolic effects on total protein. In general, hormonal effects on total protein are minimal. However, testosterone, estrogen and growth hormone were found to increase total protein in chickens. Increase in albumin level is associated with dehydration, however low albumin in the blood may be resulted from decreased albumen synthesis, renal disease or over hydration. However, the biochemical parameters examined in this present study falls within the normal range reported by Peters, (2012) for birds.

CONCLUSIONS AND RECOMMENDATONS

The present experiment has shown that *Aspilia africana* leaf extract has significant effects on the growth performance (weight gain, feed intake, feed conversion ratio and water intake) and some of the blood chemistry parameters (total cholesterol, triglyceride, high density lipoprotein, aspartate aminotransferase, alanine transaminase and alkaline phosphate) evaluated on the broiler chickens in this study. However, high intake could increase the percentage of cholesterol, high density lipoprotein, aspartate aminotransferase, total bilirubin and conjugated bilirubin.

It is therefore recommended that 3g of *Aspil-*

ia africana leaf extract in 5 liters of water could serve as drinking water of broiler chickens as it gives optimum growth performance indices of weight gain and feed conversion ratio and the blood chemistry parameters of TC, Triglyceride, High density lipoprotein aspartate aminotransferase, aspartate aminotransferase, Alkaline Phosphate, aspartate aminotransferase , Total Protein, and Conjugated Bilirubin without any detrimental effect to the well-being of the broiler chickens.

REFERENCES

A.O.A.C, 1990. *Association of Official Analytical Chemists*. Methods of Analysis, 15th Edition Washington DC.

Aiyegoro, O. A., Okoh, A. I. 2009. Use of Bioactive Plant Products in Combination with Standard Antibiotics: Implications in Antimicrobial Chemotherapy. *Journal of Medicinal Plants Research*, 3(13): 1147-1152

Asadi, F., Masoudifard, M., Vajhi, A., Lee, K., Pourkabir, M., Khazraeinia, P. 2006. Serum Biochemical Parameters of Acipenser persicus. *Fish Physiogical Biochemistry*, 32(1):43-7.

Barnes, T. S., Goldizen, A. W., Coleman, G. T. 2008. Haematology and Serum Biochemistry of the Brush-tailed Rock-Wallaby (*Petrogale penicillata*). *Journal of Wildlife Disease,* 44 (2):295-303.

Boham Kocipai- Abyyazum 1974. Flavonoids and Condensed Tannins from Leaves of Hawaiian *Vaccinium Vaticulatum* and *Vaccinium Caycinium, Pacific Science,* 48: 458-463.

Chong, K. T., Pagano, P. J. 1997. In Vitro Combination of PNV- 140690, a Human Immunodeficiency Virus Type 1 Protease Inhibitor with Ritonavir and Resistant Clinical Isolates. *Antimicrobial Agents Chemotherapy,* 41 (2): 23672377

Cowan, M. 1999. Plant Products as Antimicrobial Agents. *Clinical Microbiology Reviews,* 564-582.

Dacie, J .U., Lewis, S. M. 1994. *Practical Haematology*. Churchill Livingstone. New York: U.S.A.

Daferera, D. J, Ziogas, B. N., Polission, M. 2003. The Effectiveness of Plant Essential Oils on the Growth of *Botrytis cinerea, Fusarium sp. and Clavibacter michiganensis Subsp. Michiganensis. Crop Protection,* 22: 39-44.

Duncan, D. B. 1995. *Multiple Range and Multiple F- Tests Biometrics* 11:1-42.

Gylstorffi, I., Grimm, F. 1987. Vogelkrankheiten. - Eugen Ulmer, *Stuttgart*, pp 133-146.

Hawk, B. P, Oser, L. B., Sammarsen, H. V. (1954). *Practical Physiological Chemistry*, Mc Graw Hill Book Co. New York. 120 - 125.

Hugo, W. B., Russell, A. D. 2003. *Pharmaceutical Microbiology*. Seventh Edition: Blackwell Science.

IBM SPSS. 2013. IBM SPSS Statistics for windows, version 22.0. Armork, NY: IBM Corp.

Ihedioha, J. T, Okafor, C., and Ihedioha, T. E. 2004. The Haematological Profile of the Sprague Dewley Out-Bred Albino Rat in Nsukka, Nigeria. *Animal Research International,* 1:125-132.

Iwu, M and Hand, M. 1993. Book of African Medicinal Plants. C. R. P Press, Boca Raton Florida.

Iwu, M. M., Duncan, A. R., Okunji, C.O. (1999). New Antimicrobial of Plant Origin. Reprinted from; Perspective on New Crops and New Uses. *Journal of Janick. Edition*., Alexandria, V.A., ASHS Press.

Kaneko J.J. 1989. Clinical Biochemistry of Domestic Animals –Academic Press, 6th edition, San Diego

Leptitzki, D. A., Woolf, A. 1991. Haematology and Serum Chemistry of Cottontail Rabbits of Southern Illinois. *Journal of Wild life Disease,* 27(4): 643-649.

Masegi T., Sato, K., Kwada, M., Yanai, T and Ueda, K. 1993. Spontaneous coronary arteriosclerosis in broiler chicken. *Journal of Veterinary Medical Science,* 55: 457-459.
Maxwell, A. M. Seepersaud, R. Pingal, D.R. Mootoo and W. F. Reynolds, (1995). 3 beta-aminospirosolane steroidal alkaloids from Solanum triste. *Journal of Natural Products*, 58: 625-628.

Musyimi, D. M, Ogar, J. A., Muema, P. M. 2007. Effects of Root Extracts of *Aspilia mossambicensis* Wild on some Selected Micro-organisms. *International Journal of Biological Chemistry*, 1:213-220.

Nworgu, F. C, Ogungbenro, S. A and Solesi, K. S. 2007. Performance and some blood chemistry indices of broiler chicken served Fluted Pumpkin (*Telferia occidentalis*) leaves extract supplement. *American-Eurasian Journal of Agriculture and Environmental Sciences*, 2(1): 90-98.

Obadoni, B. O., Ochuko, P. O. 2002. Phytochemical Studies and Comparative Efficacy of the Crude Extracts of Some Haemostatic Plants in Edo and Delta State Nigeria. *Global Journal of Pure and Applied Science*, 8, 203-208.

Okoli, C. O, Akah, P. A., Okoli, A. S. 2007. Potentials of leaves of *Aspilia africana* (Compositae) in wound care: An experimental evaluation. BMC *Complementary and Alternative Medicine*, 7:24

Oloyede, O. B., Odutuga, A. A., Minari, J. B., Amballi, A. A. 2007. Assessment of Some Serum Metabolites and Enzymes of Broiler Chickens Fed Raw and Processed Bambara Groundnut. *International Journal of Poultry Science,* 6 (9): 647-650.

Onyeyili, P.A, Egwu, G. O, Jibike, G. L, Pepple, D. Y, Gbaegbulan, J. O. 1991. Seasonal Variations in Haematological Indices in the Grey-Breasted Guinea Fowls (*Numidameleagrisgallata, pallas*). *Nigeria Journal of Animal Production*, 18(2):108-111

Oyesola, T. O, Oyesola, O. A., Okoye, C. S. (2010). Effects of aqueous extract of *Aspilia africana* on the reproductive functions of female Wistar rats. *Pakistan Journal of Biological Science*, 1: 13(3):126-131

Page, J. E, Balza, F. F., Nishida, T., Towers, G. H. N. 1992. Biologically Active Dilterpines from *Aspiliamossambicensis* a Chimpanzee Medicinal plant. *Phytochemistry,* 31(10): 3437-3439.

Peng, J., Yao, X., Kobayashi, H., Ma, C. (1995). Novel Furostanol Glycosides from *Allium macrostemon, Plant Media*, 6: 58-61.

Peter S. S. 2012. *Understanding Avian Laboratory Tests*. Niles Animal Hospital and Bird Medical Center 7278 N. Milwaukee Ave. Niles-8498

Prodanovic, R., Kirovski, D., Samanc, H., Vujanac, I., Ivetic, V., Savic, B., Kureljusic, B. 2012. Estimation of Herd-basis Energy State in Clinically Healthy Holstein Cows: Practical Implications of body Condition Scoring and Shortened Metabolic Profiles. *African Journal of Agricultural Research*, 7 (3): 418-425.

Rosenthal, P. 1977. Assessing Liver Function and Hyerbilinemia in New Born. *Clinical Chemistry*, 43: 228-234.

Schalm, O. W., Jain, N.C., Carrol, E .J. 1975. *Veterinary Haematology* (3rd ed, p. 15-218). USA: Lea & Fabiger, Philadelphia.

Shahidi, F., Chavan, U. D, Bal, A. K., Mckenzie, D. B. 1999. Chemical Composition of Beach Pea (Lathyrusmaritinus) Plant Parts, *Food Chemistry*, 64:39-44.

Single 1965. Tribal names of *Aspilia Africana. Agricultural Journal*, 6 (1): 28-30

Sofowora, E. A. 1982. Medicinal Plants and Traditional Medicine in Africa. John Wiley and Sons Ltd., *Hoboken*, 64-79

Stevanovic, O., Stojiljkovic M., Nedic D., Radoja D., Nikolic V., Prodanovic R., Ivanov S., Vujanae 1. 2015. Variability of Blood Serum Biochemistry Parameters in Karakachan Sheep. *Biotechnology in Animal Husbandary* 31(1) 55-62.

Sturkie, P. O., Hazel, W., Egyum, B.O. 1970. The protein quality of cassava physiology, 3rd Edition. New York. NY Springer-Vallock, leaves. *British Journal of Nutrition*, 24:761-768.

Tietz, N.W. 1986. Textbook of Clinical Chemistry, W.B Saunder Company, Philadelphia, 76-80

Umoh, I. B., Oke, O. L. 1974. Nutritive

(Manuscript received: 23rd May, 2023; accepted: 22nd August, 2023).