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Comparative Study of the Effects of Bitter Leaf (*Vernonia amygdalina*), Scent Leaf (*Ocimum grattissimum*) and Pumpkin Leaf (*Telferia occidentalis*) Extracts on the Performance and Haematological Parameters of Broiler Birds

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ABSTRACT

A total of one hundred and twenty (120) day old Agrited breeds of broiler chicks were used in an experiment to assess the comparative study of the effects of Bitter leaf (Vernonia amygdalina),Scent leaf (*Ocimum grattissimum),* and Pumpkin leaf (Telferia occidentalis) extracts on the performance and Haematological parameters of broiler birds. The experiment was laid out in a completely randomized design (CRD) having four treatment groups and each treatment was replicated three times with each replicate having a total number of ten birds. The birds were fed and watered ad-libitum. The result obtained showed that in the average total feed intake, and average daily feed intake, there is high significant ($P < 0.05$) difference in treatments T_1 which had the values of (5489.56^a and 98.02^a) compared to T_2, T_3 and T_4. The result also showed that the body weight gain in treatment T_3 had the highest significantly ($P<0.05$). different of (2478.55^a) compared to T_1, T_2 and T_4.The result on haematolgical parameters showed that Hb and RBC concentrations of the birds across the treatment groups were not significantly different ($P = 0.05$) though there is increased numerically in the Hb especially in T4 (bitter leaf) (7.48) and identical with T3 (scent leaf) (7.07) T1 (control) (6.82) and the least value in T2 (pumpkin) (6.27) while RBC slightly decreased across the treatments level except treatment T1 (2.10) and T4 (2.18). The Packed Cell Volume (PCV), total White Blood Cell (WBC), Mean corpuscular volume (MCV), Mean corpuscular haemoglobin (MCH) and Mean corpuscular haemoglobin concentration counts of the birds were significantly increased in the groups. The Packed Cell Volume (PCV) recorded the highest value in T3 (29.12) and identical values in T2 and T4. White blood cell (WBC) also recorded the highest value in T4 with slightly change in T2 and T3 and similar value in T1. Therefore, it is recommended that the use of scent leaf (Ocimum grattissimum), bitter leaf (Vernoonia amygdatina) and pumpkin leaf (Telferia occidentalis) leaf extracts should be encouraged since they enhance the growth performance of broiler bird without any side effect.

Keywords: Bitter Leaf, Pumpkin Leaf, Haematological Parameters

INTRODUCTION

Of all commercial poultry farming in Nigeria, broiler production or broiler farming is the raising or keeping of chicken (broilers) primarily for meat production [1]. Broiler meat is mostly loved by many in Nigeria. A lot of people, who consume this meat, do so because of its nice taste, tenderness and nutritive value; it is said to be high in protein and low in calorie [1]. Based on the high demand, there has been a rise in the production of food of animal origin, particularly from poultry in the world. In this regard, [2] reported that the contribution of poultry meat is around 33% of the total global meat production. However, this phenomenon is not true for developing countries in Africa, rather it is dwindling [3]. The poultry industry is faced with a number of challenges, not only regarding the feed availability but also high cost of antibiotics [1]. [4] noted that various feed additives are used in poultry to maximize net returns and carcass quality. The effect of any feed ingredient on the haematological factors of the chicken are of immense assistance in deciding whether, or not, such a feed

ingredient will be used as poultry feedstuff [5]. Certain haematological factors such as packed cell volume, red blood cell, hemoglobin, etc., can be associated with certain production traits and serve as means of assessing clinical and nutritional health status of animals. For instance, it has been established that high Packed Cell Volume (PCV) and high haemoglobin content (Hb) are associated with high feed conversion ratio while high percentage white blood cells especially lymphocytes are associated with the ability of the chicken to perform well under very stressful conditions.

Feed additives are ingredients added to poultry diets to enhance production efficiency, improve health and reduce morbidity [6]. A major feed additive which has been used for decades in poultry production is the antibiotics. Bans on the use of antibiotics as feed additives have accelerated and led to investigations on natural alternative feed additives in animal production [7]. Biogenic and plant-derived products have proven to be natural, less toxic, residue free and are thought to be ideal feed additives in animal feed production. Rich store houses of medicinal plants exist everywhere especially in Africa which offers a vast reservoir of plants that have been categorized [8]. [9] noted that the use of medicinal plants all over the world predates the introduction of antibiotics and other modern drugs into the African continent. To gain advantageous effects of herbs and spices, they can be added to feed as dried plants or parts of plants and as extract. Some herbal leaves which have been used in poultry/broiler nutrition as extract or leaf meals include bitter leaf [10,11]. Another important herbal leaf whose benefits can be harnessed in poultry nutrition is scent leaf (*Ocimum gratissimum*). Scent leaf (*Ocimum gratissimum*), the African variety of basil (*Ocimum gratissimum*), is widely grown as a perennial herb in tropical Africa, South East Asia, India and Hawaii. It is highly recognized worldwide due to its versatile nutritional, anaesthetic, and medicinal uses [12]. [13] noted that scent leaf is rich in alkaloids, tannins, phytates, flavonoids, oligosaccharides, terpenoids, thymol and saponin, with tolerable cyanogenic content. The proximate composition as reported by [14] shows a crude protein of 4.7%, 10.8% crude fibre, and ash content of 12.24%. The essential oil (eugenol) present in scent leaf possesses antimicrobial activities against pathogenic strains of gram-negative and gram-positive bacteria and pathogenic fungus [15]. The plant is consumed by the Igbos as a leafy vegetable and the nutritional importance of this plant centres on its usefulness as a seasoning because of its aromatic flavour. It is also used by the Igbos in the management of the baby's cord. It is believed to keep the baby's cord and wound surface sterile. It is used in the treatment of fungal infections, fever, cold and catarrh. *Ocimum gratissimum* is used throughout West Africa as anti- malarial and anti-convulsant. The crushed leaf juice is used in the treatment of convulsion, stomach pain and catarrh. Oil from the leaves have been found to possess antiseptics, antibacterial and antifungal activities [16]. Bitter leaf (*Vernonia amygdalina*) is a shrub or small tree and one of the edible vegetables in Nigeria and other parts of African sub regions [17]. It performs both medicinal and nutritive functions [18].[19] describes a medicinal plant as any plant in which one or more of its organ contains substances that can be used for therapeutic purposes or which are precursors for the synthesis of useful drugs. It is popularly called bitter leaf because of its abundant bitter principles [20]. The leaves contain a considerable amount of anti-nutritional factors like high level of tannic acid and saponin. Proximate composition of *Vernonia amygdalina* Leaf Meal (VALM) shows a chemical composition of 527.83 ME kcal kgG1, 86.40% DM, 21.50% CP, 13.10% CF, 6.80% EE, 11.05% Ash and the result on mineral composition indicate that *Vernonia amygdalina* has 3.85% Ca, 0.40% Mg, 0.03% P, 0.006% Fe, 0.33% K and 0.05% Na [21]. It is commonly called "bitter leaf" because of its bitter taste. The bitterness

can, however, be abated by boiling or by soaking the leaves in several changes of water. In Nigeria, it is known variously as —Ewuro in Yoruba language, —Onugbu in Igbo language, —Oriwo in Benin language, —Ityuna in Tiv, —Chusardoki or fatefate in Hausa, while it is known as —Etidot in Cross River State of Nigeria. The bitter taste is due to anti-nutritional factors such as alkaloids, saponins, tannins, and glycosides [21]. It is one of the natural feed additives which can be of great productive and health importance in the broiler industry. Futed pumpkin (*Telferia occidentalis)* is a leaf vegetable that is widely cultivated in the tropics and subtropics. Chemically *Telferia occidentalis* leaf extract contains 21.31% crude protein, 6.41% crude fibre, 5.50 ether extract, 10.92% ash, and 3121ME (kcal/kg) [22]. The protein from *Telferia occidentalis* leaves can be harvested and fed to farm animals as solution in the form of protein concentrates [23]. Fluted pumpkin contains naturally active components that comprise polysaccharides, fixed oils, para-aminobenzoic acid, peptides, sterol, and proteins [24,25]. The fruits are a good source of carotenoid and aminobutyric acid [26,27,28]. The succulent tasty leaves, stems and seeds make fluted pumpkin one of the widely eaten vegetables in homes and in restaurants across West Africa (Abiose, 2009). Fluted pumpkin leaves are rich sources of protein, oil, vitamins, minerals, folic acid, calcium, zinc, potassium, cobalt, copper, iron, vitamins A, C and K but low in crude fibre [29,30] Relative to most vegetables, its protein content is very high [31,32]. Leaves of fluted pumpkin are cheap source of nitrogen [33]. According to Kayode and Kayode, 2011, leaves of *Telferia occidentalis* are rich in minerals, antioxidants, vitamins (such as thiamine, riboflavin, nicotinamide and ascorbic acid. The young leaves also possess a high level of magnesium (8.69 mg 100-1g) and iron (3.60 mg 100-1 g) [34] and due to its richness in iron and also an excellent proportion of essential amino acids to total nitrogen, the leaves can be used to prevent and eliminate anaemia [35]. Young shoots and leaves are used for making soups and may be cooked alone or in mixture with other vegetables. Immature seeds are usually preferred to mature ones and are eaten cooked or roasted [36]. The nutritional value of the seeds (53% fat and 27% crude protein) justifies their wide consumption [37]. The seed cotyledons due to their high protein content are processed into seasonings and are also utilised for infant weaning foods [38], bread flour supplement and in making different local fermented foods “Ogiriugu” [39]. However, the usefulness of the seed as a source of protein is limited by the presence of anti-nutrients such as phytic acid which have been revealed to have harmful physiological properties on growing rats and chicks [40], [41]. These anti-nutrients tend to lower the bioavailability of minerals in humans and inhibit the digestibility of plant proteins [42].

MATERIALS AND METHODS

Location of Experimental Site

The project was carried out at the poultry unit of Federal College of Agriculture, Ishiagu, Ebonyi State. Ishiagu is located within the derived savannah area of the South-East zone of Nigeria with an annual rainfall of 1600-2000mm which occurs between March and November with a period of dry spell in between. It has an average temperature of 27^{0}C and is situated at Latitude 5.5^{0}North and Longitude 7.31^0 East with a Relative Humidity of about 88% [3].

Source of Experimental Materials

Fresh leaves of bitter leaf, scent leaf and pumpkin leaf were bought from the Eke market at Ishiagu, Ivo L.G.A. Ebonyi State. These were washed thoroughly without squeezing with clean tap water to remove dirt (sand and dust). Washed leaves were air-dried at room temperature for two weeks until they became brittle. The dried leaves were pulverized using a hammer mill and stored in an air-tight

plastic container. Fifty (50) grams of pulverized leaves was infused in 1 Litre of hot boiled water for 12 hours (overnight). The infusion was thereafter, filtered using a filter paper and the filtrate administered to the chicks according to the treatment doses. Infusion was prepared daily.

Experimental Birds and Design

A total of one hundred and twenty (120) unsexed broiler birds were randomly allotted into four treatments designated T1- 0, T2- 50, T3- 50 and T4- 50 mLG1 of Bitter leaf (*Vernonia amygdalina)*, Scent leaf (*Ocimum gratissimum)* and Pumpkin leaf (*Telferia occidentalis)* infusion per litre of drinking water. Each of the treatment was replicated three times with Ten birds per replicate in a Completely Randomized Design (CRD). Water was made available to the chicks *adlibitum*. All chicks were fed *adlibitum* with same commercial diet.

Management of Experimental Birds and Duration

The experimental birds were reared on a deep litter system; on a cemented floor covered with wood shavings up to a height of about 7cm. The pen was partitioned such that each partition accommodated ten (10) birds. The litter was changed weekly to keep it disease-free. The birds were weighed to ascertain the initial body weight. Feed and water were provided *ad-libitum* and other management practices were carried out properly. Feed intake was recorded daily and the birds weighed weekly. The trial lasted for six (6) weeks.

Data Collection

Growth Performance

-Average initial weight (g) was obtained by dividing the collective initial weight by the total number of birds

- Average final weight (g) was obtained by dividing the collective final weight by the total number of birds

- Average weight gain (g) was obtained by subtracting Average initial weight from the average final weight

- Average daily feed intake (g) was obtained by dividing the sum of feed intake per bird by the experimental period

- Average feed intake (g) was obtained by dividing the total feed intake by the number of birds

-Feed Conversion ratio was obtained by dividing the Average feed intake by the Average body weight gain.

Haematological Analysis

Blood samples were collected at the last week of the trial; in the morning, from each treatment. The blood samples were collected using sterilized syringe and needles through the wing vein. The samples were collected into a set of sterilized test tubes containing Ethylene Diamine Tetra-acetic Acid (EDTA) as anti-coagulant, for the analysis of haematological parameters which included:

Packed Cell Volume (PCV)
Red Blood Cell Count (RBCC)
White Blood Cell Count (WBCC)
Haemoglobin (Hb)(g/d)
Mean Corpuscular Haemoglobin Concentration (MCHC)
Mean Corpuscular Volume (MCV)

Data Analysis

Data collected were subjected to statistical analysis using one way analysis Duncans New Multiple range test at 5% level of significant difference(SPSS 2011).

The model of CRD used is;

$X_{ij} = U + T_i + e_{ji}$

Where

X_{ij} =Any observation made in the experiment.

U = Observation means

T_i = effect of the dosage

E_{ij} = residual error

Table 1: Effects of Bitter Leaf (*Vernonia amygdalina*), Scent Leaf (*Ocimum grattissimum*), and Pumpkin Leaf (*Telferia occidentalis*) Extracts on the Growth Performance of Broiler Birds.

Parameters	T1	T1	T3	T4	SEM
Initial body weight (g)	144.00	146.00	169.00	153.00	
Final body weight (g)	2335.90^{c}	2310.77^{c}	2627.55^{a}	2494.00^{b}	22.36
Weight gain (g)	2191.90^{c}	2164.11^{c}	2478.35^{a}	2341.00^{b}	22.03
Av daily weight gain (g)	39.14^{c}	38.64^{c}	44.25^{a}	41.80^{b}	0.39
Av total feed intake (g)	5489.56^{a}	54.80^{a}	5393.42^{b}	5480.58^{a}	11.87
Av daily feed intake (g/d)	98.02^{a}	97.85^{a}	96.31^{b}	97.86^{a}	0.21
Feed conversion ratio	2.50^{a}	2.53^{a}	2.17^{c}	2.34^{b}	0.02

^{Abcd}Mean with similar superscripts among the same row are not significantly (P>0.05) difference.

The effect of dietary treatments on the final body weight, weight gain, average daily weight gain, average total feed intake, average daily feed intake and feed conversion ration of the birds were not significantly (p>0.05) different across the treatment group studied. However, the Final body weight of birds fed different leaf meal in T3 was numerically higher (2627.55g/birds) than the rest experimental birds (23335.90, 2310.77 and 2494.00 g/birds) in T1, T2 and T4 respectively. This finding is similar to those of [23] who reported that control group had lower feed intake compared to the treatment groups when *Moringa oleifera* leaf meals were fed to White Leghorn type of chickens. Similar trends were observed for average daily feed intake. Also, the highest weight gain (2478.35 g/bird) was observed in birds in T3, followed by T4 (2341.00g/birds), T1 (2191.90g/birds) while the lowest weight gain (2164.111 g/bird) was recorded in T2. The least feed conversion ratio (1.99) was observed in T3 (2.17), followed by T4 (2.34), T1 (2.50) while the highest values was recorded in T2 (2.53). This assertion is supported by [40], 43 and [44] who reported better feed conversion ratio for birds on biogenic diets as compared to the control diets. For average daily feed intake and average total feed intake had the highest value in T1 (98.02g/d) and (5489.56g) respectively while the least values were recorded in T3 (96.31g/d) and T2 (5393.42g) respectively.

Table 2: Effects Of Bitter Leaf (*Vernonia amygdalina*), Scent Leaf (*Ocimum grattissimum*), and Pumpkin Leaf (*Telferia occidentalis*) Extracts on the Hematological Parameters of Broiler Birds.

Parameters	T1	T1	T3	T4	SEM
PCV (%)	26.15^{c}	27.34^{b}	29.12^{a}	27.90^{b}	0.24
Hemoglobin (g/dt)	6.82^{b}	6.27^{c}	7.07^{b}	7.48^{a}	0.09
RBC (x102µ1)	2.10^{a}	1.87^{b}	1.69^{c}	2.18^{a}	0.04
WBC (x103µ1)	22.64^{ab}	22.38^{b}	22.33^{b}	22.90^{a}	0.08
MCV (β)	125.66^{c}	146.37^{b}	172.39^{a}	128.47^{c}	3.66
MCH (pg/cell)	32.53^{c}	33.60^{bc}	41.88^{a}	34.35^{b}	0.71
MCHC (pg/cell)	325.30^{c}	335.95^{bc}	418.84^{a}	343.54^{b}	7.18

^{Abcd} Mean with similar superscripts among the same row are not significantly (P>0.05) difference.

PCV = Packed Cell Volume
WBC = White Blood Cell
RBC = Red Blood Cell
MCV = Mean Corpuscular Volume
MCH = Mean Corpuscular Hemoglobin
MCHC = Mean Corpuscular Hemoglobin Concentration

The table above shows the haematological parameters of the various treatments. Hb and RBC concentrations of the birds across the treatment groups were not significantly different (P = 0.05) though there is increased numerically in the Hb especially in T4 (bitter leaf) (7.48)

and identical with T3 (scent leaf) (7.07) T1 (control) (6.82) and the least value in T2 (pumpkin) (6.27) while RBC shown slightly decreased across the treatments level except treatment T1 (2.10) and T4 (2.18). The Packed Cell Volume (PCV), total White Blood Cell (WBC), Mean corpuscular volume (MCV), Mean corpuscular haemoglobin (MCH) and Mean corpuscular haemoglobin concentration counts of the birds were significantly increased in the treated groups. The Packed Cell Volume (PCV) recorded the highest value in T3 (29.12) and identical values in T2 and T4. White blood cell (WBC) also recorded the highest value in T4 with slightly change in T2 and T3 and similar value in T1. The PCV and WBC result agreed with the reports of [45] and [46] who observed a significant ($p<0.05$) improvement in feed conversion ratio. This improvement could be associated with a better utilization of feed which facilitated higher nutrients absorption that leads to higher PCV concentration and higher percentage WBC. From the result also, MCV and MCH recorded the highest value in T3 (172.39) and (41.88) respectively, MCV recorded identical values in T1 (125.66) and T4 (128.47), whereas MCH recorded slightly increased in T4 (34.35), T3 (33.60) and T1 (32.53). Finally, MCHC recorded the highest value in T3 (418.84), followed by T4 (343.54), T2 (335.95) while the least value was found in T1 (325.30).

CONCLUSION

The results obtained in this experiment indicate that air dried helped Scent leaf (*Ocimum grattissimum*), Bitter leaf (*Vernonia amygdalina*) and Pumpkin leaf (*Telferia occidentalis*) to retain the chlorophyll in the leaves and also reduce the chances of losing the mineral contents. The leaf extracts especially Scent leaf improved body maintenance and it was tolerable, acceptable and favourable to poultry. It could also be concluded therefore that these leaf extracts most especially Scent leaf extract improved the water intake and blood parameters of the birds. This research could help to stem over dependence of broiler farmers, especially the low holding backyard farmers, on importation of antibiotics in developing countries thus leading to reduction in the cost of feeding and subsequently making poultry meat available to the resource populace.

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