

1 **Haematology and carcass visual appraisal of broiler chickens fed supplemental diets of**
2 ***Aspilaafricana*, *Azadirachta indica* and *Centrosema pubescence* leaf meals in Humid**
3 **Tropical Nigeria**
4

5 **ABSTRACT**

6 A study to determine the haematology and carcass visual appraisal of broiler chickens fed
7 basal feeds supplemented with different leaf meals was conducted. Four treatments: basal
8 proprietary broiler feed only (T₁ - PBF) as control, basal proprietary broiler feeds with
9 *Centrosema pubescence* (T₂ - PBF + CLM), *Azadirachta indica* (T₃ - PBF + NLM) and
10 *Aspilaafricana* (T₄ - PBF + ASLM) respectively, were used in a completely randomized
11 design (CRD). On the last day of a 63-day feeding and growth trial, a set of 2ml blood
12 samples were taken from 3 broilers per treatment into plastic tubes containing the anti-
13 coagulant ethylene diamine tetraacetic acid (EDTA) for the determination of haematological
14 parameters: PCV, Hb, RBC and WBC. The MCHC, MCH and MCV were also determined.
15 Visual appraisals of their external body parts per treatment were also carried out. Results on
16 the blood parameters of broilers fed *Aspilaafricana*, *Azadirachta indica* and *Centrosema*
17 *pubescence* leaf meals showed normal blood values recommended for healthy
18 birds. Similarly, broilers fed these leaf meals showed a better appeal for their carcasses
19 because of the yellow pigmentation of their body parts (shank, skin, beak and ear lobes). This
20 will be an advantage to the consumers because it supplies vitamin A necessary for better
21 vision. It was concluded that poultry farmers incorporate *Aspilaafricana*, *Azadirachta indica*
22 and *Centrosema pubescence* at 5% inclusion levels in broiler feeds because it is not
23 deleterious and can be of additional advantage due to the attractiveness of their carcasses to
24 consumers.

25
26 **Key words:** Broilers, leaf meals, haematology, carcass body parts, visual appraisal.

27
28 **1. INTRODUCTION**

29 The feed crisis facing the poultry industry in Nigeria strongly suggests the need to
30 investigate and utilize cheap and easily obtainable non-conventional feed resources. One of
31 such non-conventional feed resources is leaf meal. The incorporation of protein from leaf
32 sources in diets for broilers is fast gaining grounds because of its availability, abundance and
33 relatively reduced cost. It had earlier been observed that leaf meal do not only serve as
34 protein sources but also provide some necessary vitamins, minerals and also oxy-carotenoids
35 which causes yellow colour of broiler skin, shank and egg yolk [1].

36 Many feed materials are fed to animals usually without recourse to their health and
37 physiological implications on the animals. The commonest method for measuring these
38 implications is through the haematology of the animals [2]. There has been the emphasis that
39 nutritional studies should not be limited to performance and carcass quality alone, but its
40 effect on blood constituent is also very relevant [12]. Therefore, the comparison of an
41 animal's haematological and biochemical values with a reference interval will provide
42 evidence for numerous conditions such as infection, malnutrition and stress[3]. Similarly,
43 laboratory tests on blood have been revealed as very vital tools to detect any deviation from
44 the normal in the animal or human body [8]. Furthermore, with the growing knowledge of
45 the quality of animal protein supplies in human diets, and the preference for carcasses of
46 good visual appraisal, it becomes imperative for poultry feed manufacturers and farmers to
47 source tangible alternatives to cope with the current challenges in the meat market.

48 Plant leaves such as *Aspilia africana*, *Azadirachta indica* (Neem) and *Centrosema*
49 *pubescence* abound within the humid tropical environment of the South-south geopolitical
50 zone of Nigeria and has not been maximally utilized as leaf meal supplements in poultry
51 feeds. However, investigations on the use of the leaves especially *Aspilia africana* and
52 *Azadirachta indica* (Neem) has been on their utilization as traditional medicines in maintaining
53 the health and welfare of both rural and urban dwellers in developing countries[9 ; 10]. There
54 is therefore the need to investigate the effects of predominant plant materials:
55 *Aspilia africana*, *Azadirachta indica* (Neem) and *Centrosema pubescence* as leaf meal
56 supplements on the haematology and carcass appearance of broiler chickens in the area.

57 2. MATERIALS AND METHODS

58

59 2.1 Experimental site

60

The experiment was conducted at the poultry unit of the Teaching and Research Farm, Ignatius Ajuru University of Education Ndele Campus, Rivers State (Latitude 4⁰ 58' N and Longitude 6⁰ 48' E), Nigeria.

2.2 Processing of test ingredients

Fresh leaves from the young stems of the test ingredients: *Centrosema pubescence*, *Aspilaafricana* and *Azadirachta indica* (Neem) were manually harvested from the bush and fallow sections within the premises of the Ignatius Ajuru University of Education at Ndele Campus. The fresh leaves were collected in batches in labeled bags. The leaves together with their stems were spread on black polythene on an open floor in a greenhouse and air dried for seven (7) days until it became crispy and shredded to separate the leaves from the stems. Air drying of the leaves was carried out to reduce moisture content, to prevent fungal growth and easy milling of the materials. The milling was done with a hand grinding machine. The milled products represent the test materials which were incorporated differently in the proprietary basal concentrate feeds.

2.3 Birds and distribution to treatment groups

A total of one hundred and eighty (180) day old of Marshal strain of broiler chicks were brooded in the brooding unit (deep litter system) for 4 weeks (28 days) using stove and kerosene lanterns. The chicks were randomly allotted to four (4) dietary feed treatment groups: basal proprietary broiler feed only (T₁ - PBF) as control, basal proprietary broiler feeds supplemented with *Centrosema pubescence* (T₂ - PBF + CLM), *Azadirachta indica* (Neem) (T₃ - PBF + NLM) and *Aspilaafricana* (T₄ - PBF + ASLM). The respective leaf meals were incorporated at 5% supplemental levels into the basal proprietary broiler feeds.

87 **2.4 Determination of Haematological Parameters**

88 On the last day of a 63-day (9 weeks) experimental feeding and growth trial, a set of
89 blood samples were taken from 3 birds per dietary treatment randomly. The blood samples
90 were collected by carefully cutting the jugular veins of each birds and collecting 2ml samples
91 of blood into plastic tubes containing the anti-coagulant ethylene diaminetetraacetic acid
92 (EDTA) for the determination of haematological parameters.

93 The Haematological values of the blood samples were estimated for packed cell
94 volume (PCV) and haemoglobin (Hb) concentration. Red blood cell (RBC) and total white
95 blood cell (WBC) as well as the differential WBC counts were determined using the
96 Neubauer haemocytometer after appropriate dilution. Values for the constants: mean
97 corpuscular haemoglobin concentration (MCHC), mean corpuscular haemoglobin (MCH)
98 and mean corpuscular volume (MCV) were calculated from RBC, Hb and PCV values.

99

100 **2.5 Visual appraisal on pigmentation of external body parts**

101 At the end of the experiment after 63-days (9 weeks), the broilers from the leaf meal
102 treatment groups (T_2 , T_3 and T_4) and control (T_1 – without leaf meal treatment) were also
103 physically assessed based on the yellowish pigmentation of the skin, beak, earlobe and shank.

104

105 **2.6 Statistical Analysis**

106 The haematological data obtained from birds in each treatment group were compared
107 statistically on the basis of the different dietary treatments using Analysis of Variance
108 (ANOVA) procedure for a Completely Randomized Design (CRD) [4]. Significant means
109 were separated using the Duncan's New Multiple Range Test [4].

110

111 **3. RESULTS AND DISCUSSION**

3.1 Nutrient composition of leaf meals and basal concentrate broiler finisher feeds

The nutrient composition of the different leaf meals, the proprietary broiler feed (finisher) and those supplemented with the different leaf meals fed to the experimental broiler chickens is similar to those reported by [5].

3.2 Haematological Characteristics of broilers

Table 1 shows results of the haematological characteristics of broiler chickens exposed to the experimental diets: T₁- non- supplementation with leaf meal) used as control and other feeds supplemented with different leaf meals: T₂ (proprietary finisher basal feed supplemented with *Centrosema* leaf meal – PFBF + CLM), T₃ (proprietary finisher basal feed supplemented with Neem leaf meal - PFBF + NLM) and T₄ (proprietary finisher basal feed supplemented with *Aspilina* leaf meal - PFBF + ASLM) for 5 weeks after brooding (finisher phase).

The packed cell volume (PCV) value of the broilers fed with the experimental diets T₁ (leaf meal un-supplemented feed) and those supplemented with different leaf meal: T₂ (proprietary finisher basal feed supplemented with *Centrosema* leaf meal – PFBF + CLM), T₃ (proprietary finisher basal feed supplemented with Neem leaf meal - PFBF + NLM) and T₄ (proprietary finisher basal feed supplemented with *Aspilina* leaf meal - PFBF + ASLM) were not significantly ($P > 0.05$) different. The PCV value of the broilers ranged from 31.00 – 33.33% for T₂ and T₁ respectively. The PCV values reported in the study for the broiler chickens were within the normal range (22 – 35%) reported by [6] for normal or healthy chickens. Similarly the values of PCV observed in this study for birds whose feeds were supplemented with Neem leaf meal (T₃) is within the range (30 – 40%) for broilers as reported by [1]. This implies that supplementation of broiler feeds with the different leaf meals has no deleterious effect on the broilers as they maintain their normal blood count [7].

The haemoglobin (Hb) value of the broilers fed with the experimental diets T₁ (leaf meal un-supplemented feed) and those supplemented with different leaf meal: T₂ (proprietary finisher basal feed supplemented with *Centrosema* leaf meal – PFBF + CLM), T₃ (proprietary finisher basal feed supplemented with Neem leaf meal - PFBF + NLM) and T₄ (proprietary finisher basal feed supplemented with *Aspilia* leaf meal - PFBF + ASLM) were not significantly ($P > 0.05$) different. The haemoglobin value of the broilers ranged from 9.97 – 11.07g/dl for T₄ and T₁ respectively. The haemoglobin values reported in the study for the broiler chickens were within the normal range (7.0 – 13.0 g/d) reported by [6] for normal or healthy chickens. This implies that supplementation of broiler feeds with the different leaf meals has no deleterious effect on the broilers [7].

The Red blood cells (RBCs) value of the broilers fed with the experimental diets T₁ (leaf meal un-supplemented feed) and those supplemented with different leaf meal: T₂ (proprietary finisher basal feed supplemented with *Centrosema* leaf meal – PFBF + CLM), T₃ (proprietary finisher basal feed supplemented with Neem leaf meal - PFBF + NLM) and T₄ (proprietary finisher basal feed supplemented with *Aspilia* leaf meal - PFBF + ASLM) were not significantly ($P > 0.05$) different. The Red blood cells (RBCs) value of the broilers ranged from $3.40 - 3.70 \times 10^{12}/l$ for T₄ and T₁ respectively. The Red blood cells (RBCs) values reported in the study for the broiler chickens were within the normal range ($2.5 - 3.5 \times 10^{12}/l$) reported by [6] for normal or healthy chickens. This implies that supplementation of broiler feeds with the different leaf meals has no deleterious effect on the broilers as they maintain their normal blood count [7].

The Mean corpuscular haemoglobin concentration (MCHC) value of the broilers fed with the experimental diets T₁ (leaf meal un-supplemented feed) and those supplemented with different leaf meal: T₂ (proprietary finisher basal feed supplemented with *Centrosema* leaf meal – PFBF + CLM), T₃ (proprietary finisher basal feed supplemented with Neem leaf

meal - PFBF + NLM) and T₄ (proprietary finisher basal feed supplemented with *Aspilia* leaf meal - PFBF + ASLM) were not significantly ($P > 0.05$) different. The Mean corpuscular haemoglobin concentration (MCHC) value of the broilers ranged from 32.13 – 33.20g/100ml for T₄ and T₂ respectively. The Red blood cells (RBCs) values reported in the study for the broiler chickens were within the normal range (26.0 – 35.0 g/100ml) reported by [6] for normal or healthy chickens. This implies that supplementation of broiler feeds with the different leaf meals has no deleterious effect on the broilers as they maintain their normal blood MCHC [7].

The Mean corpuscular haemoglobin (MCH) value of the broilers fed with the experimental diets T₁ (leaf meal un-supplemented feed) and those supplemented with different leaf meal: T₂ (proprietary finisher basal feed supplemented with *Centrosema* leaf meal – PFBF + CLM), T₃ (proprietary finisher basal feed supplemented with Neem leaf meal - PFBF + NLM) and T₄ (proprietary finisher basal feed supplemented with *Aspilia* leaf meal - PFBF + ASLM) were not significantly ($P > 0.05$) different. The Mean corpuscular haemoglobin (MCH) value of the broilers ranged from 28.47 – 30.83pg for T₄ and T₂ respectively. The Mean corpuscular haemoglobin (MCH) values reported in the study for the broiler chickens were lower than the normal range (33.0 – 47.0 pg) reported by [6] for normal or healthy chickens. This variation may be due to difference in the breeds of fowls [6].

The Mean corpuscular volume (MCV) value of the broilers fed with the experimental diets T₁ (leaf meal un-supplemented feed) and those supplemented with different leaf meal: T₂ (proprietary finisher basal feed supplemented with *Centrosema* leaf meal – PFBF + CLM), T₃ (proprietary finisher basal feed supplemented with Neem leaf meal - PFBF + NLM) and T₄ (proprietary finisher basal feed supplemented with *Aspilia* leaf meal - PFBF + ASLM) were not significantly ($P > 0.05$) different. The Mean corpuscular volume (MCV) value of the broilers ranged from 88.50 – 91.17fl for T₄ and T₂ respectively. However, although broilers

in the T₁ and T₂ exhibited higher MCV values, those of T₃ and T₁ were still within the normal values for birds. No mortality was recorded; hence the experimental diets were not deleterious.

Table 1: Haematology of broiler chickens fed basal concentrate diets supplemented with different leaf meals

Parameters	Treatments				Mean	±SEM
	T1(PFBF)	T2 (PFBF + CLM)	T3(PFBF + NLM)	T4 (PFBF + ASLM)		
PCV (%)	33.33	31.00	33.00	30.33	31.92	2.88
Hb(g/dl)	11.07	10.50	10.97	9.97	10.63	0.85
RBC X10 ¹² /l	3.70	3.40	3.70	3.43	3.56	0.35
MCHC (g/100ml)	33.17	33.13	33.20	32.13	32.91	1.04
MCH (pg)	29.90	30.83	29.70	28.47	29.45	1.17
MCV (fl)	90.13	91.17	89.27	88.50	89.77	0.90

PFBF = Proprietary broiler Finisher Basal Feed; NLM = Neem Leaf Meal; CLM = Centrosema Leaf Meal; ASLM = Aspilina Leaf Meal; PCV = Packed cell volume; Hb = Haemoglobin; RBC = Red blood cell; MCHC = Mean corpuscular haemoglobin concentration; MCH = Mean corpuscular haemoglobin; MCV = Mean corpuscular volume.

3.3 Pigmentation pattern of external parts of broilers

Table 2 shows the pattern of pigmentation or colouration (white, fairly yellow or very yellow) of the external body parts (shank, skin, beak and ear lobe) of broiler chickens exposed to their basal feeds (non-supplemented/supplemented) with different leaf meals. Results from the visual appraisal revealed variations in the colour patterns of the treatment groups. It was observed that the leaf meal supplemented groups (T₂ = PFBF + CLM, T₃ = PFBF + NLM and T₄ = PFBF + ASLM) possessed yellowish pigmentations on their shanks, skin, beak and ear lobes. However, the degree of yellowness of these body parts slightly differed. Thus the T₂ (PFBF + CLM) treatment group showed very yellow (VY) colouration as compared to their fairly yellow (FY) (T₃ = PFBF + NLM and T₄ = PFBF + ASLM) counterparts. The body colouration of broilers in T₁ (PFBF only) showed white (W) colouration of the parts. The yellow pigmentation of the various leaf meal supplementation

groups may be as a result of the presence some pigmenting agents in the different leaves [11]. This is can be attributed to the presence of different xanthophylls of the general family of carotenoids resulting in pigmentation of the skin, fat, breast, and shanks and egg yolk [1].

Table 2: Visual appraisal of pigmentation of body parts of broiler chickens fed basal concentrate diets supplemented with different leaf meals

Treatment	Colour of external body parts											
	Shank			Skin			Beak			Ear lobe		
	W	FY	VY	W	FY	VY	W	FY	VY	W	FY	VY
T ₁ (PBFF only	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No
T ₂ (PBFF + CLM	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
T ₃ (PBFF + NLM)	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No
T ₄ (PBFF + ASLM)	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No

PBFF = Proprietary broiler Finisher Basal Feed; NLM = Neem Leaf Meal; CLM = Centrosema Leaf Meal; ASLM = Aspilina Leaf Meal; W = White; FY = Fairly yellow; VY = Very yellow.

4. CONCLUSION AND RECOMMENDATION

The investigation on the blood parameters of broiler chickens fed leaf meal supplemented diets of Goat weed (*Aspilina africana*), Neem (*Azadirachta indica*) and *Centrosema pubescence* showed normal blood values as recommended for healthy birds. This further confirms that the use of the leaf meals at 5% inclusion level in basal broiler feeds is not deleterious to birds. Similarly, it was revealed that broilers whose feed were supplemented with different leaf meals showed a better appeal of their carcasses for consumption. The carcasses of the leaf meal treatment groups were better because of the yellow pigmentation of the different body parts (shank, skin, beak and ear lobes) due to the presence of carotenoids in these leaves. This will be of a better advantage to the consumers because of the supply of vitamin A that is good for better vision. Poultry farmers can also

incorporate them in their broiler chicken feeds as it can be of an additional advantage due to the attractiveness of their carcasses to consumers to improve their profit margins.

#REFERENCES

1. Esonu, B.O., Opara, M.N, Okoli, I.C. Obikaonu, H.O. Udedibie, C., and Iheshiulor, O.O.M. (2006). 'Physiological responses of laying birds to Neem (*Azadirachta indica*) leaf meal based diets, body weight, organ characteristics and hematology'. Online Journal of Health and Allied Science 5(2) April-June 2006. Available at <http://cogprints.org/5168/1/2006-2-4.pdf>.
2. Aro, S. O., Ogunwale, F. F. and Falade, O. A. (2013). Blood viscosity of finisher cockerel fed dietary inclusions of fermented cassava tuber wastes. *Proceedings of the 18th Annual Conf. of Anim. Sci. Assoc. of Nig.*, 74-77.
3. Clifford, G. R and Briggs, H. (2007). Hematologic and Biochemical Reference Intervals for Mountain Goats (*Oreamnos americanus*): Effects of Capture Conditions. *North West Science*. 81 (3): 206 – 214.
4. Obi, I.U. (2001). Statistical Method of Detecting between Treatment Means. SNAAP Press Nigeria Limited, Enugu, Nigeria.
5. Kalio, G.A., Manilla, H.A., Wariboko, O.N. and Okafor, B.B. (2014). 'Mineral profiling, carcass quality and sensory evaluation of broiler chicken fed basal proprietary diets supplemented with leaf meals'. *African Journal of Livestock Extension*, 14: 77 – 83.
6. Benerjee, G.C. (2004). *A textbook of animal husbandry*, 8th Edition. Oxford and IBH Pub., Co., PVT, LTD.
7. Sembulingam, K and Sembulingam, P. (2002). *Essentials of Medical Physiology*. 2nd Edition. Jaypee Brothers Medical Publishers (P) Ltd, New Delhi. (840 pp).
8. Alemede, I.C., Adama, J.Y., Ogunbajo., S.A. & Abdullahi J (2010). Haematological Parameters of Savanna Brown Does Fed Varying Dietary Levels of Flamboyant Tree Seed Meal. *Pakistan Journal of Nutrition*, 9 (2): 167-170.
9. Adeniyi, B.A and Odufowora R.O (2000). In-vitro Antimicrobial Properties of *Aspilia africana* (Compositae). *African Journal of Biomedical Research*. 3: 167-170.
10. Iwu, M. M. (1993) *Handbook of African Medicinal Plants*. CRP Press, Boca Raton Florida.

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11. Devendra, C. (1989). Shrubs and tree fodders for farm animals. Proceedings of a workshop in Denpasar, Indonesia. pp. 61 – 75.
12. Animashaun, R.A., Omoikhoje., S.O. and Bamgbose , A.M. (2006). Haematological and Biochemical Indices of Weaner Rabbits Fed Concentrate and *Syndrellanodiflora* Forage Supplement. *Proceeding of 11th Annual Conference of the Animal Science Association of Nigeria (ASAN), Ibadan, Nigeria.* 15 – 19 September, 2006. pp. 29-31).